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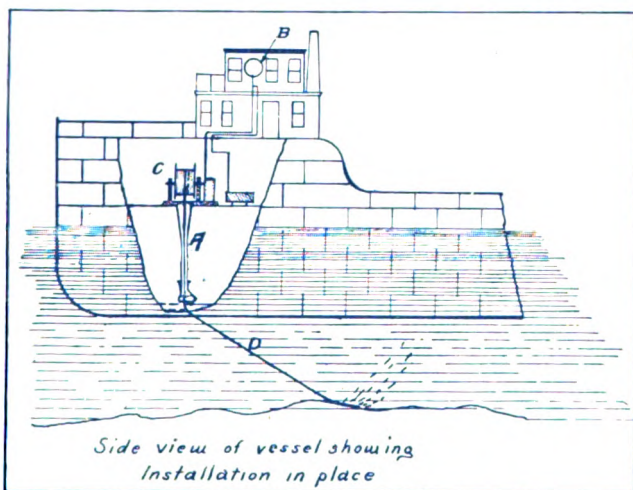
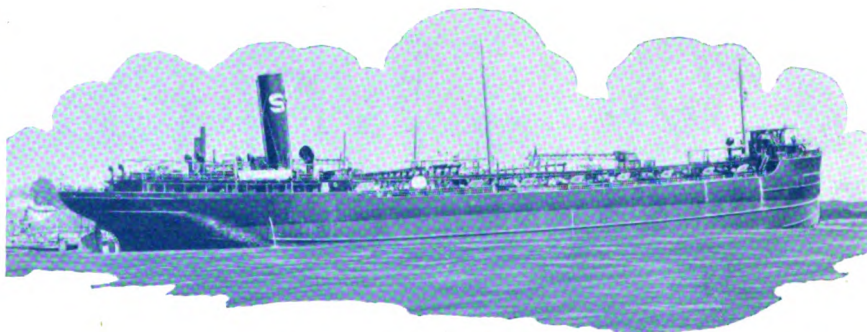
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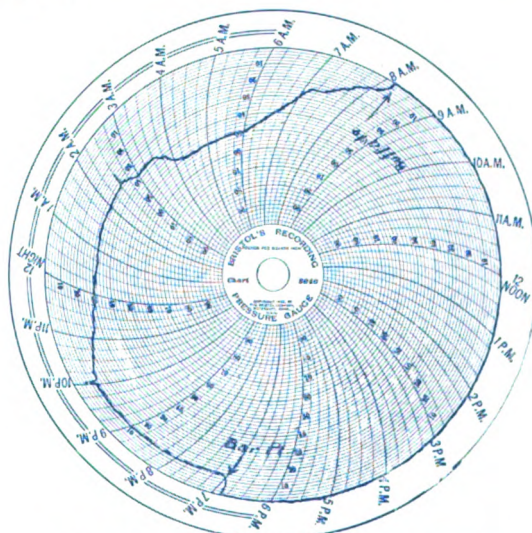
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**T**HE water supply system for Greater New York was designed with the thoughts of reserve supply and safety foremost. Up in the Catskills, near the source of this water supply, is the Ashokan reservoir. This is ample for New York in the far distant future. A few miles away is the Kensico reservoir, built for safety. On the outskirts of the city there is a third reservoir, and on Staten Island a fourth.

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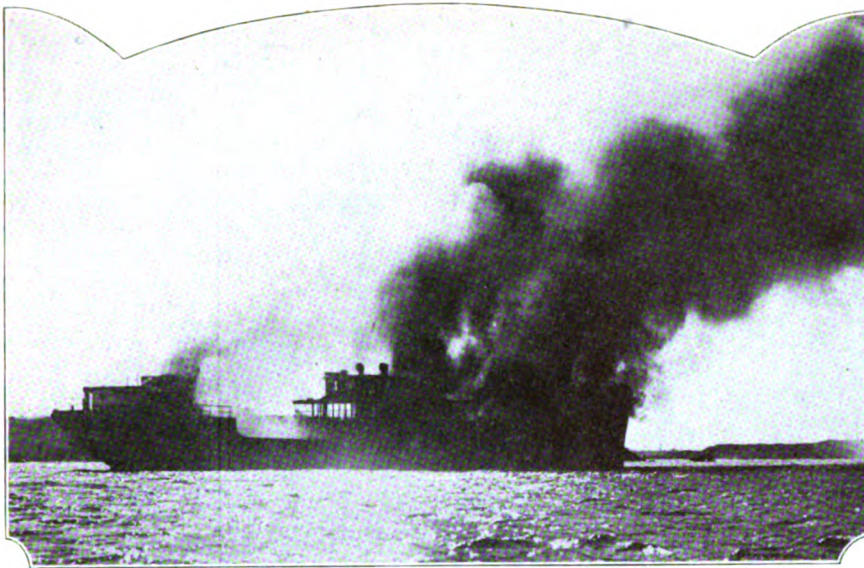
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Government wooden steamer Coyote burned a few weeks ago to yield her metal. Engine and machinery had previously been sold. This is the method many favor to eliminate drain on treasury in maintaining obsolete, war built ships

# Marine Review

December

1924

## Farrell Wants Ships Scrapped

**I**N SEASON and out, MARINE REVIEW has been urging a policy which would eliminate the government from the shipping business. The reason is perfectly clear. Only the socialistically inclined find anything in government ownership or operation to approve. Every marine leader is avowedly against federal tampering with the marine business. But when the divorce should be granted is still a cause for debate.

The federal treasury is a comfortable cushion and even those who have no direct financial interest find nourishment in forecasting what good things the government can do before it finally retires, leaving the private owner to inherit its riches. MARINE REVIEW has always felt that this policy of half quitting and half staying, was in reality altogether harmful. The disappearance of the shipping board as a fleet operator might shatter some high flying hopes, but it will certainly bring into the light the day of the private owner.

### ***Private Ownership Is Everybody's Friend***

Almost every government official and too many marine men declare for private ownership but are content to see the present hybrid arrangement keep up just a little longer. The President, as pointed out on this page last month, knows that government competition is sure death to the private competitor. Private control of shipping will never come to life until the question of removing federal competition is fought to a decision.

In view of its conviction, MARINE REVIEW naturally finds new encouragement when leading shipping men voice similar views. A few days ago, President James A. Farrell of the Steel corporation confronted the al-

ways impressive group of marine leaders at the annual banquet of the naval architects' society, and spoke some plain facts about the marine situation.

He feels that probably 50 per cent of the ocean going tonnage of the United States (practically all shipping board vessels) is obsolete and should be scrapped. This is in direct line with the sensible suggestion frequently made in these columns that the shipping board take a real step to get out of business by selling its vessels. If a consistent program of ship sales at auction had been put in practice several years ago, the ships now would have been in private hands; the majority might have been scrapped, but their deadening effect on the shipping market and the shipbuilding industry would have been removed. And without ships, the board could take up its normal function of a regulatory and advisory body.

### ***The Path of Greatest Service***

To win a truly successful merchant marine, in the opinion of Mr. Farrell, means that government ownership and operation will have to give way to private ownership and operation. The shipping board can do its greatest service to American shipping by working for private ownership now rather than trying to develop a series of plans by which some day, some how or other, a pretty framework of a merchant marine, all properly reinforced at federal expense, can be turned over to private shipowners as a sure winner.

These opinions can be held and fought for without reflecting on the personnel of the board. Few find much if anything to criticise in the individual board members, but the system which they represent must go and private shipping regain its birthright.

# Care and Use of Electric Winches

By A. O. LOOMIS

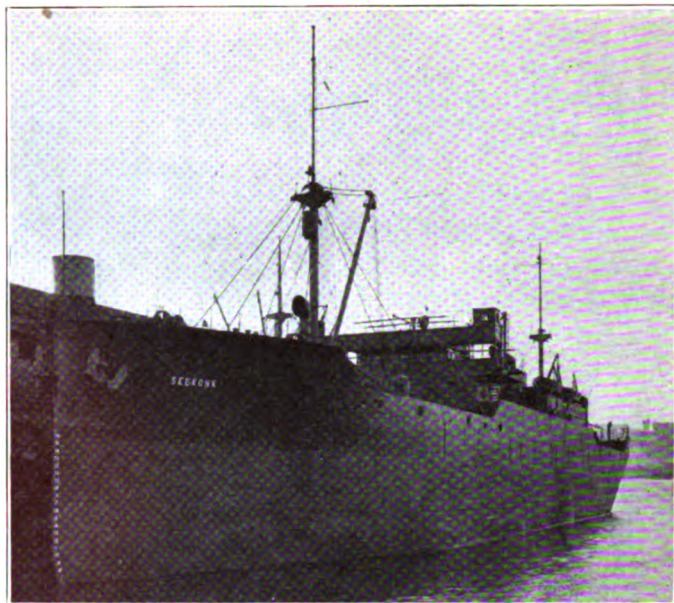


Fig. 1.—Motorship SEEKONK is fitted with electric driven auxiliaries

CARGO is the general term applied to merchandise intended for transportation on waterways, lakes or oceans. Cargo which can be handled in bulk, such as grain, coal, oil, sand, timber, etc., is called bulk cargo. For the transportation of such cargo, special kinds of vessels are usually operated between certain ports. Thus, oil tankers, ore carriers, colliers, etc., are loaded with the kind of cargo for which they are intended. These vessels have the maximum amount of hold spaces, so constructed that great freedom of loading and unloading is possible. Liquid cargo, chiefly petroleum products, is handled by pumping it into and out of special tankers.

Miscellaneous goods of all kinds and forms, are classed as general cargo. Examples include machinery parts and castings, pigs of lead, ingots of copper or tin, bundles of wire and cane, oak staves, planks and lumber of all sorts, barrels of apples, bags of sugar, casks of tallow, sacks of flour, cement, oil cake, cases of canned goods, crates of fruit, rabbits or poultry. The several varieties of shape, size and weight of these commodities constitute a very difficult problem of cargo handling confronting the port authorities, stevedores, and ships' personnel.

## Facilities on Shipboard

The handling of cargo on shipboard is accomplished in three ways:

- (1) Through the hatches or openings in the deck.
- (2) Through side ports.
- (3) From the deck where the commodity is stowed in the open, as for instance the adding of lumber as a deck load after the inside spaces have been filled.

Side ports are used on river steamers and coastwise vessels. Freight is moved through side ports by means of hand trucks, conveyors or ship's tackle. Usually

the winches are smaller when placed in blind hatches for the purpose of loading or unloading cargo through the side ports.

Although the handling of cargo through open hatches is the method most universally used, the electrical equipment described in this article is applicable to winches for use under any of the systems here set forth.

## Use of Cargo Winch

The handling of freight through hatches can be accomplished by the use of (1) ship's booms and tackle, (2) ship's tackle in connection with pier winches, (3) wharf cranes, (4) floating cranes or lighters, (5) specialized equipment, as for instance, ore unloaders, conveyors for bananas, etc.

Wharf cranes are used mostly in foreign ports. Such cranes are usually large enough to handle any article that can be stowed in a ship.

A large portion of the freight handled at the ports of the United States is moved by the ship's winches. Lines which are operated from the winch drums or heads are led through blocks attached to the booms and masts.

The line commonly called "the whip" is the flexible medium made of hemp or strands of steel, through which the load is lifted, lowered or swung. The block is the pulley through which the direction of motion of the line is transferred.

Usually the cargo winch is idle more than it is active, due to the fact that the vessel is at sea more than in port. However, when idle at sea, the winch is exposed to rain, snow, and ice. Sometimes the waves beat against the equipment. Despite these unfavorable conditions, the winch is needed for immediate service when port is reached. Obviously,

such service must be reliable and sometimes continuous during the ship's stay in port.

The winch should be rugged with important parts accessible, occupy minimum deck space, have the moving parts protected so that the line can not foul the equipment, have the gears and machined parts protected from the weather, have provision for adequate lubrication, operate quietly, and have a suitable and efficient form of electric drive.

In Fig. 2 is shown a compound geared winch manufactured by the American Engineering Co. and installed on the motorship WILLIAM PENN. The rating of the winch is 3-6 tons for which a compound motor, 30 horsepower motor at 400 revolutions per minute is used. The diameter of the winch drum is 18 inches, the high and low gear ratios being 12.5 and 26.5 to 1 respectively. The clutch for the operation of the second reduction from the first, can be left in neutral, in which case the hoisting drum proper will be inoperative, only the two small gypsy heads turning when the motor is running. A shoe-type, shunt wound brake has its wheel mounted on the motor shaft. This brake is capable of handling overloads on the hook, and since its action is almost instantaneous after the controller handle is brought to the off position, there is but little use for the foot brake also supplied with this winch.

## Methods of Handling Cargo

When the central drum of the winch is used, one end of the rope is permanently fastened to it, and several turns are wound on it, even with the hook in the lowest position in the ship. Under no condition of operation is there any slipping of the rope on the drum,

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except insofar as one turn may slip on another.

When the operator is working with the end drum or gypsy head, he winds the rope around the head, but does not attach it. The loose end of the rope is thrown or coiled behind the operator when the load is raised or lowered. Let us assume that the load is being hoisted. The winch must be running so as to raise the hook for the way in which the rope is wound on the head. When the operator tightens the rope on the drum, pulling harder on the loose end, this tightening causes the head to "bite" the rope and lift the load. The number of turns on the drum and the pull exerted by the operator determine, within the capacity of the winch, the weight of the load which can be lifted. For lowering, the motion of the drum is usually reversed. However, skillful operators can lower loads, especially light ones, by slipping the rope on the drum.

In addition to raising or lowering of the cargo in the vessel, or over the pier, a horizontal movement of the load from the hatch to the side of the ship is necessary. This operation is secured either by swinging the single boom outboard, or placing a second boom with its free end out over the ship's side, and attaching its line along with that used for hoisting, to the load. Winding in on the outboard cable will move the load from the hatch opening across the deck, and over the ship's side. This method of cargo handling called "Burtoning," will be described later.

The services of a master stevedore or

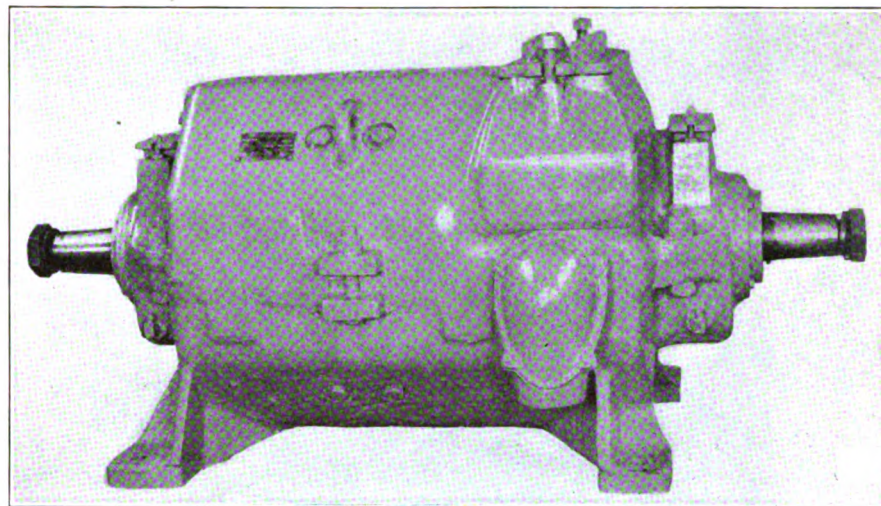


FIG. 3—WATERTIGHT MOTOR OF MASSIVE FRAME

stevedoring company are solicited by the owner of the vessel to be loaded. A master stevedore is one who is capable of planning and executing the stowage of cargo on shipboard. He is perfectly familiar with the various classes of ships, their equipment, and the commodities they carry. He is a good organizer, and director of men, and can secure satisfactory results quickly.

The master stevedore has foremen and longshoremen whom he engages to do the actual loading of the vessel. Often the longshoremen are hired just previous to the time when they commence the work at the entrance of the pier at which the vessel is tied.

A gang is made up of about 20 long-

shoremen. When unloading a vessel, about one-third of the men are in the "hold" making up the drafts, one-half are on the pier receiving the freight, and the remainder are on deck. On deck, a winchman runs two winches, the gangway man gives the signals, and the whip runner returns the fall or whip to the new draft. When the ship is being loaded, the disposition of the men on shore and in the hold will be the reverse of that for unloading.

The ship's electrician has the electric winches in readiness for instant service. No preliminary warming up of the winches is necessary. The hatches are cleared by rolling back the tarpaulin (canvas) which covers the hatch boards, removing the boards by hand, setting them aside and moving by means of the winches the "strongbacks" or steel beams which support the covers.

For single whip operation, in loading the ship, the load is dragged on skids or inclined plankways up to the hatch coaming. Since the boom must be placed over the hatch, there is no means for lifting the draft perpendicularly from the pier.

On the pier, the merchandise is trucked to the lower end of the skid, where a sling is laid on the floor. A rope sling has its ends closed, and the sides close together. The packages are laid on the sling, and the ends are brought up over, the long end being passed through the other. The hook on the end of the whip is attached to the long end of the sling.

The gangway man gives the signal to the winchman who operates the controller, and the load is dragged along the skids and out over the hatchway. The load is lowered so that it remains suspended above the deck on which it is to be placed. Some of the hold men swing the load as far as possible in the direction in which it is to be stowed, the

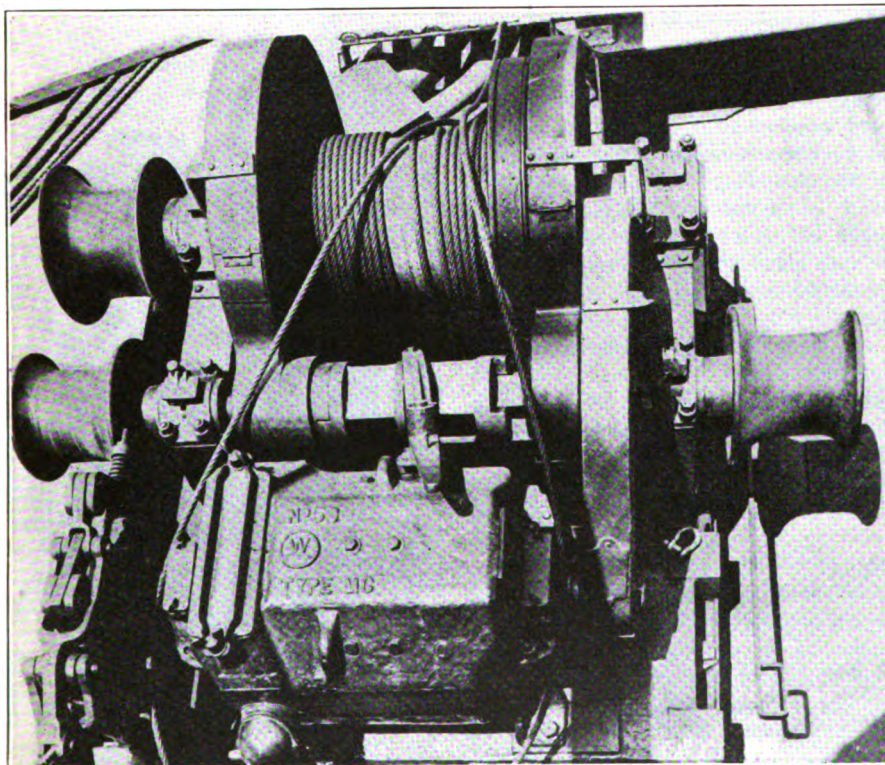


FIG. 2—COMPOUND GEARED WINCH ON MOTORSHIP WILLIAM PENN

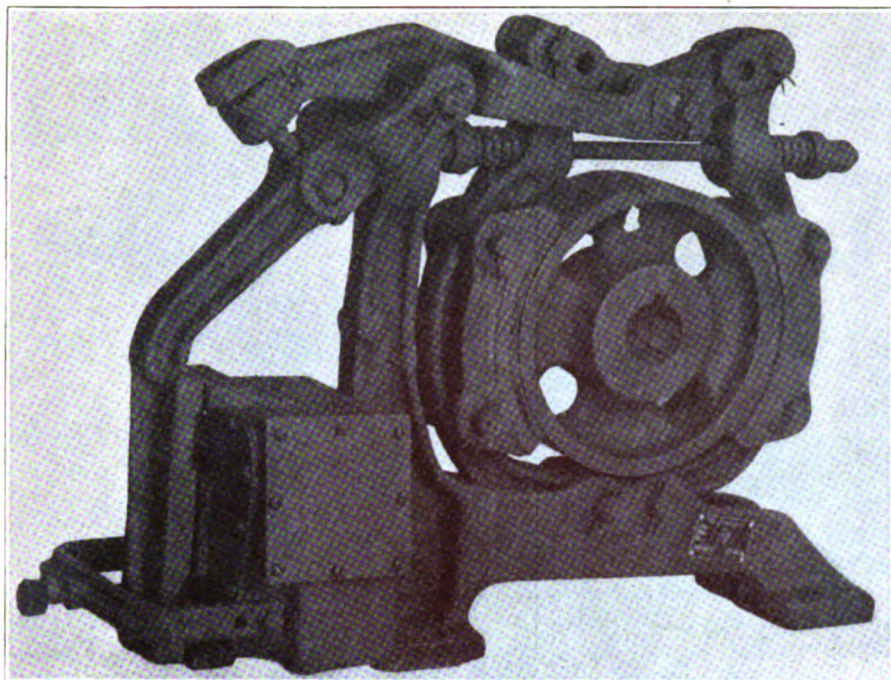


FIG. 4—MARINE TYPE BRAKE FOR CARGO WINCH MOTOR

winchman being able to land it accurately. The loaded sling is replaced on the hook by an empty one which is raised by the whip, caught by the whip runner, and thrown to the pier. The cycle is again repeated.

The single whip method of cargo handling is slow, also there is danger of damaging some of the freight by dragging it over the skids, swinging of booms, etc.

#### Burtoning Method

By the use of two booms and two falls, the handling of cargo can be speeded up considerably, also there is no need of dragging the cargo on skids. The central boom has its end block through which the up and down fall passes, over the hatch, and the second boom has its end block through which the Burton fall passes, over the pier. The ends of both falls are fastened to the load, which when loading the ship, is lifted from the pier on the Burton fall, moved over the deck by means of both falls, and finally transferred to the up-and-down fall by which it is lowered to the hold or platform under the hatch. Two winches, one for each fall, are needed to care for this so-called Burtoning method of handling cargo.

It is seen that this method is not dependent upon the swinging of booms, the motions of which must be carefully gaged. Since nothing moves but the lines and the hook, the action is very positive, for when one line is carrying, the hook is directly in position over the hatch, and when the other line is carrying, the hook is directly over the door in the pier shed.

There are some who consider the Burtoning system a poor method of handling cargo, because the load is lowered to a precise spot. If this depositing point is blocked, the system is put out of action until the place is clear. The quay crane used extensively abroad is free from this disadvantage on account of its radial action. However, this apparent advantage is offset by the necessity of swinging the cargo instead of moving it in direct lines.

The half-hour rating for winch motors corresponds to that used for crane or general hoist work. Knowing the average weight of each draft, the efficiency of the winch, and the hoisting speed required at rated load, we use for the horsepower rating of the winch motor the following formula: Half hour rating of motor in horsepower equals weight of draft in pounds multiplied by the rope speed in feet per minute divided by 33,000 multiplied by efficiency of winch.

The rated speed of the motor to comply with these conditions is that for which the gear ratio of the winch is best suited, or that upon which the manufacturer has standardized as a result of his knowledge of the trade requirements. The speed load curve of the motor is referred to for speeds other than normal. The power necessary for the different operations (Burtoning, lowering loaded hook, hoisting empty hook, etc.) is known as a result of the study of graphic current curves or direct reading meter tests taken from similar winches handling cargo, or a series of test loads.

When the frame size of the motor

is selected on the basis of the half-hour rating required for hoisting, a check is made to determine whether the frame size is sufficiently large to care for the heating over certain cycles or periods of operation carried on throughout the loading or unloading processes.

#### Allowance for Heating

Since the heating varies as the square of the current, and the time during which the current flows, the cycle can be divided into well defined sections for special operations (hook load, hoist load, rest, lower empty hook, etc.), each having the value of the current squared multiplied by the actual time in seconds required for the operation. When the motor is running at normal speed or faster, the actual time values are recorded under "equivalent" time. However, when the motor is at rest, or during periods of acceleration, heat is dissipated less rapidly, therefore under "equivalent" time, there are recorded figures less than the actual time values (50 per cent in the case of an enclosed motor).

The summation of the  $A^2T$  values divided by the total equivalent time values, gives the mean square value of the current. Extracting the square root of this, gives the root mean square (R.M.S.) value. This R.M.S. value of current, both for the armature and the fields, is known for the various sizes

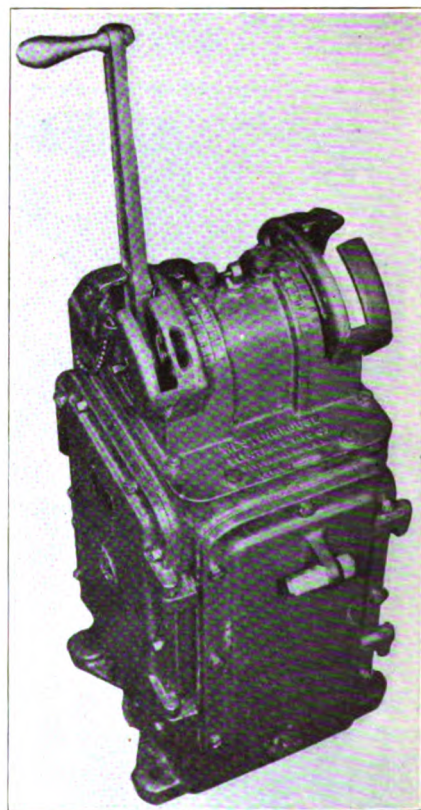


FIG. 5—WATERTIGHT CAM CONTROLLER FOR DECK SERVICE

of motors manufactured for this class of service. The check of the motor frame size selected is now made to see that it has a larger R.M.S. rating than that obtained from the actual cycle values. If the motor has insufficient R.M.S. rating to meet the demands of the cycle, then obviously a larger frame size must be selected.

Experience shows that the all-day operation of the winch motor in intermittent duty gives heating effects equal to a continued repetition of the cycle of operation for a period of five hours. This is because of unavoidable delays encountered in actual service. It is, therefore, usually safe to select the size of a winch motor on the 5-hour basis, so far as heating effects are concerned.

With the generating braking system such as is used with the ordinary type of winch, the current through the series field is not the same as that through the armature when lowering the load. Hence, to be strictly correct, the values of the armature and field currents should be separated. The final result would appear in two R.M.S. values, one for the armature, and one for the field. However, calculations having refinements of this sort, are usually not necessary. Operating conditions vary to such an extent that factors of safety are introduced in one way or another to cover the worst of the different cases arising.

#### Winch Motor

As clearly shown in Fig. 3, the winch motors have massive frames and feet, large shafts and are water tight. The fields and armature coils are both insulated with high temperature insulation, which enables the motor to be rated on the basis of 75 degrees Cent. temperature rise. The motors are wound with series or compound windings.

The frames which are cast steel, are divided horizontally. The joints are machined, and red lead applied at the joint for the purpose of avoiding leaks. The halves of the frame are held together by means of six large bolts.

The large opening at the front of the motor over the commutator is convenient for the inspection and adjustment of the brushes which are supported on two arms attached to the top half of the frame. In addition, these motors have hand-holes closed by covers, and gaskets at each end of the frames. The inspection of the lower interior parts of the motor is accomplished through the hand holes.

The motors have four main poles and two commutating field poles, all laminated. All poles are bolted from the outside except the lower commutating field pole, which has its bolts entered from the inside to permit the removal of the

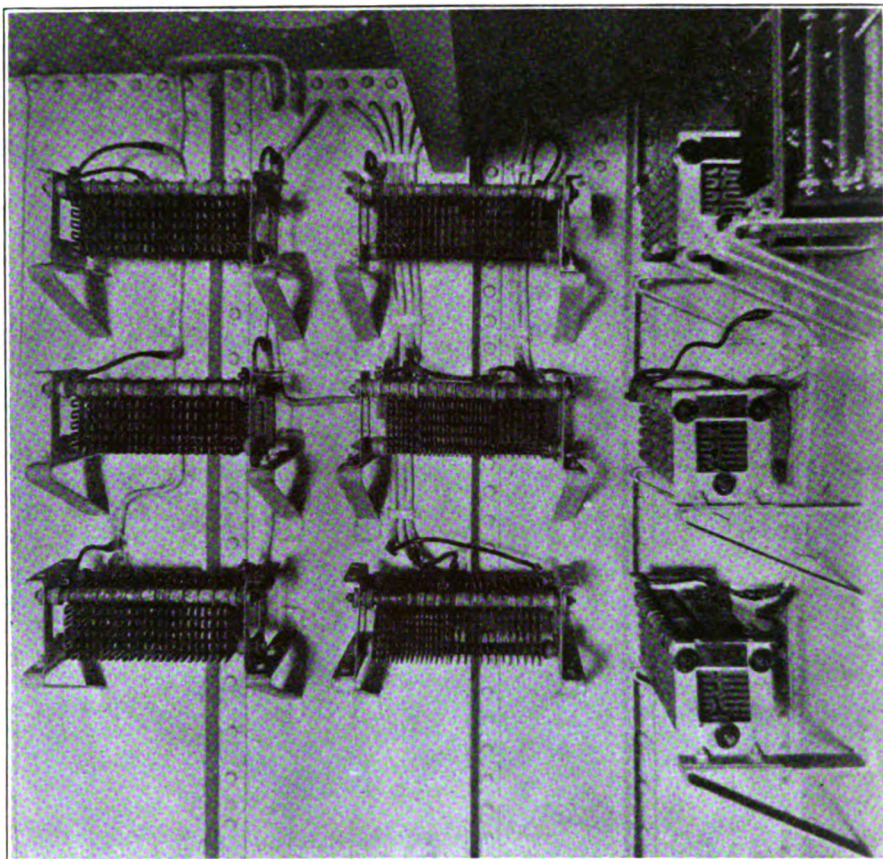


FIG. 6—RESISTORS IN DECK HOUSE OF MOTORSHIP SEEKONK

pole and coil from the motor without removing the lower half of the motor from the bedplate.

A junction box for the entrance of conduit is provided on either side of the motor at the split of the frame where the leads are brought out. A rubber gasket is used between the box and each half of the frame to which the box is bolted. The box is fitted with a large removable cover which gives accessibility to the connections. Any disconnecting of the leads necessary to separate the frame can be done outside of the motor in the junction box.

The larger size motors have strap-wound series and commutating field coils. The smaller sizes have asbestos covered square wire. The shunt field coils are wound with enamel and single cotton insulated wire, and are impregnated with a high grade insulating compound, and then given two coats of special varnish. In the compound wound machines, the series and shunt coils are taped separately and placed on the pole pieces as independent units.

The armature coils are form-wound with mica and asbestos insulation and dipped in a special moisture-resisting insulating varnish.

Armature bands over the coil ends are put on under a heating process which softens the insulation and insures the permanent location of coils and bands in service. The core bands rest on both

the armature coils and the teeth. No wedges are used in the core.

The brush holders are of the sliding box type. Each brush holder is insulated from the frame by a porcelain bushing and a micarta tube around each supporting rod. The micarta tube is protected by a brass screen.

The bearings consist of split cast iron, babbitt lined shells. They are supported in bearing housings cast integral with the frame, and are clamped between the two halves of the frame. Oil lubrication by means of oil rings is standard for this type of motor.

Shafts which have tapered extensions at both ends are large, and made of axle steel. It is possible to press out the shaft without disturbing the commutator or windings.

To prevent leakage of water inward, stuffing boxes having graphitized asbestos packing are used where the shaft extends through the outside of the brackets.

#### Design of Brakes

The brakes used for service on the cargo winch motors are of the shoe type, magnet operated. They are attached by means of two feet to the bedplates on which the motors rest. A view of this type of brake is shown in Fig. 4.

For winch service, (spur gear drive) a brake which will hold the armature

shaft from turning under full load torque is recommended.

Shunt brakes are recommended, especially for straight reversing service, because trouble is often experienced with a series brake setting on the light load current used for running the equipment with its friction load only. The action of the shunt coil is sufficiently rapid so

are included to prevent the mechanism from sticking under the action of salt water.

The watertight controller shown in Fig. 5 is well suited for deck service, especially for winches which are operated usually by a rough class of labor.

The protective panel may be included as a part of the controller in a water-

which open and close the main line circuit are protected by magnetic blowouts which aid in extinguishing any arcing that may occur.

Each contactor is closed by a cam operating on a roller on the moving contact element, and opened by a strong compression spring when the cam is moved away from the roller.

The frame is of very rugged cast iron construction, with removable front and side doors. These are hinged and can be closed by bolting to the frame, the flanges being fitted with heavy rubber gaskets insuring watertightness.

The cam shaft is actuated by a vertical handle operating through miter gears in the top of the casing. The shaft for this handle is extended on both ends so that the operator has the choice of two operating positions. A star wheel and pawl are provided in the mechanism to enable the operator to "feel" the notches and make it impossible to leave the controller in intermediate positions.

In order to guard against plugging the equipment by throwing the handle instantaneously from full hoist to full lower, or *vice versa*, a mechanical time element is introduced by a staggered construction of the guide segment of the handle. The travel of the controller handle in returning from either extreme through the off position, is directed against a stop in the off position, which requires a right-angular movement of about 1 inch before the handle is free to pass through to the opposite position.

When the controller is not being operated, the handle may be taken down and bolted securely in place on a lug on one of the doors.

#### Motorship "William Penn"

For the protection of the motor and controller circuits, there is provided a protective panel having a line contactor, overload relay and knife switch mounted on an ebony asbestos panel. As before stated, this panel may, or may not be constructed as a part of the watertight controller. If desired, a jamming relay can be provided instead of, or in addition to, the overload relay.

The resistors for the armature and series field circuits are of the sherardized cast grid type. They are assembled in steel frames, and insulated from the frame and each other by the best grade of mica. All connecting leads which make up a part of the resistors are asbestos insulated, and are connected to the resistor grids by special copper terminals. Shunt field discharge and brake resistors are of the tube type.

The shipping board's first motorship, the WILLIAM PENN, a vessel of 12,375 deadweight tons, operated by the Barber Steamship Lines, has been in service over

(Continued on Page 508)

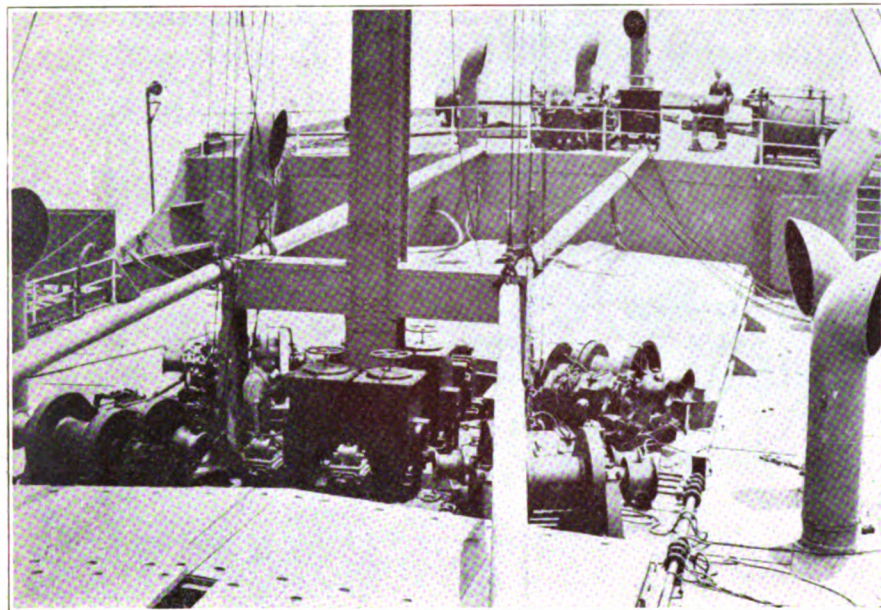


FIG. 7—GROUP OF WINCHES ON THE WILLIAM PENN

that either the release or the setting occurs within a fraction of a second. More rapid action of the shoes is not desirable, especially where dynamic braking in the off position increases the total braking effort. The slight retarded action of the solenoid brake at the beginning of the setting lessens the wear of the shoes. The brake shoes are made of asbestos having a copper wire mesh.

The operating coil, after being impregnated and baked, is enclosed in a watertight housing which is filled with a waterproofing cement. The ends of the housing form magnet poles, which attract the brake arm when the coil is energized.

Wiring connections enter at the side or bottom of the coil housing casting, which can be drilled as desired, either for a stuffing tube or conduit.

A bolt with a handle for turning into a cast brass bracket, and having sufficient travel to move the brake arm, is provided for manually releasing the brake shoes from contact with the wheel.

Compensation for the wear of the brake shoes can be made by adjustment of a bolt at the top of the brake arms. After the proper adjustment, the bolt can be locked in position.

The pressure of the brake shoes on the wheel can be adjusted by means of lock nuts on the spring rod.

Bronze pins, bushes, and brass washers

tight cabinet, bolted to the side, or separately mounted in a nonwatertight enclosure. Likewise, the resistors may be protected by a special watertight covering as shown in some of the figures accompanying this article, or the open type grids may be mounted in a protected location. The mounting of the protective panel and resistors in a suitable deck house or protected location, is preferable to the use of watertight cabinets for these adjuncts. The question of accessibility of these parts of the equipment in locations protected from the elements is of great importance. Fig. 6 shows the mounting of winch resistors in a deck house on the motorship SEEKONK.

These cam controllers are used for starting and adjusting the resistors in series and parallel with the motor armature. The protective panels give overload and low voltage protection. The resistors are designed for heavy intermittent (speed regulation) duty, having a time rating equivalent to two minutes on, out of a total of four minutes.

The contactor switches function the same as those of contactor controllers, except that the contactors are operated by cams mounted on the controller shaft. Normal movement of the controller handle causes the contactors to open or close with a quick positive action which reduces arcing. The line contactors

# How to Select Auxiliary Power

## A Study of Problems of Power and Heat as Affected by Use of Diesel Engines

BY S. HALLE

**S**TEADY growth in the application of diesel engine ship propulsion has been marked by changes and advances in the application of auxiliary power. Auxiliary power may be generally defined as the use of energy—either power or heat, for any purpose outside of propulsion.

The amount of energy required of such uses may be a considerable part of the total power of the vessel. Factors affecting this relation are many—the size and speed of vessel, class of service, zone or zones of operation, etc.

The installation of diesel propulsion is obviously a step toward greater economy in fuel and labor costs. It is, therefore, logical to consider carefully the choice of auxiliaries that will add to and not detract from the higher standard sought.

The purpose of this article is to discuss some of the applications of auxiliary power, their relation to economical operation and to point out the advantages of using electricity for many applications of power and heat.

A recent report by the marine committee of the American Institute of Electrical Engineers (Jour. A. I. E. E. 1924, page 754), said "owing to the success attending past installations of electric motors on ship board, it is now almost universally recognized that electricity will be the future power for ship's auxiliaries outside of machinery spaces for all vessels, for all auxiliaries in diesel engine propelled vessels and a portion of engine room auxiliaries in steam vessels."

The first diesel propelled vessels were small and probably called for little consideration for auxiliaries. As the success of the diesel engine became established, its application to larger vessels followed a logical course, and the consideration of auxiliary power became more involved.

It might be well to list the various requirements for auxiliary power before proceeding to discuss any in detail:

### I Mechanical Requirements

- a Steering.
- b Pumps.
- c Hoists and Winches.
- d Ventilation.
- e Miscellaneous, Power, refrigeration, etc.

The author, S. Halle, is marine engineer, Edison Electric Appliance Co., Chicago.

### II Electrical

- a Illumination.
- b Communication.

### III Heating Requirements

- a Quarters heating.
- b Hot water system.
- c Steward's department.

Now consider the above list and observe the changes brought about by a change from steam to diesel propulsion.

It is obvious that with diesel propulsion the requirements under class I cannot be other than electrical, save by the use of an auxiliary steam boiler with the necessity for attendance and maintenance of steam lines, traps, etc. So it may be generally stated that with diesel propulsion, the trend is to use electric power for this classification.

### Use for Heating

Of Class II, little need be said, since these uses are peculiarly electrical and call for no change from existing steam vessel practice, except that the electrical generators now become driven by a diesel engine, probably of a simpler and smaller type than the main engines.

In Class III, one encounters more radical changes in auxiliary application. Quarters heating is some times accomplished by steam from a donkey boiler. This arrangement has the disadvantages spoken of under Class I and in addition some problems peculiar to the design of a vessel. For example, many cargo vessels are designed with crew quarters and engines well aft and the navigation and officers quarters forward of the cargo hatches. Heating of the crew's space can be easily reached from an engine room auxiliary boiler, but the forward spaces means long steam lines with returns, traps, etc. The same condition would be met if the heat of the exhaust gases or cooling water was used to heat quarters.

Consideration, therefore, has been given the use of electric heaters, particularly for spaces remote from the engine room. On a fuel economy basis solely, electric heat would probably not be justified, but when investment and maintenance costs are considered, the use of some electric heat is usually justified.

Several classes of electric heaters are used for this service. The type using a coiled resistance wire held on insulated supports is the least desirable in our

judgment, being susceptible to injury, vibration, oxidation, and is rather bulky to avoid high temperatures. A later type uses a radiator similar to a hot water or steam system and has a quantity of liquid hermetically sealed in it. An electric immersion unit is located so as always to be in the liquid. Control may be by a multiple snap switch or automatic thermostat.

The wattage required will vary with the exposure of the space to be heated. It will range from 2 to 10 watts per cubic foot for the extreme of temperatures encountered in ordinary zones of operation. Care should be given to proper sheathing and port hole construction to avoid high heat losses through walls and openings.\*

The use of electric heaters as "boosters" is also practised. The steam heating system is designed to take care of moderate temperature changes, and any excess is supplied by electric heaters. This system has in some cases materially simplified the steam system and reduced size and costs of the heating system.

### Heating Passenger Ships

Before leaving this subject it would be well to recall to those familiar with passenger ship operation, the great amount of supervision required by the heating system. Leaks seem to be unavoidable and the damage caused to passenger space is often severe before the leaks are detected. With an electrical system, the same wires that serve to light the ship can be enlarged to carry the heating load, thus eliminating much piping, drains, etc.

The hot water requirements of a vessel that has diesel engine can be met in several different ways. The heat of the exhaust may be utilized to keep storage tanks full of hot water, fresh or salt. These tanks usually feed the water system by gravity and can be conveniently placed near the exhaust stack.

Electric water heaters can be used in a similar manner on large storage tanks,

\*There are many well known formulas for determining the B. t. u. requirement of any given space to be heated. To convert B. t. u.'s per hour to kilowatts, it is only necessary to recall the relation that there are 3412 B. t. u.'s. in a kilowatt hour.

or the system may be simplified by grouping the hot water taps to be fed from one or more smaller tanks, each with its own electric heater, manually or automatically controlled, to maintain the tank full of hot water. The tank water may be stored at a temperature well in excess of the usable temperature and mixed with cold water by a thermal valve. Such a system simplifies greatly the piping of a vessel. The demands of such a system for the energy may be controlled so that the tank heaters are on when other electrical requirements are low, that is, "off peak."

For small vessels, or those having comparatively few men, the system of one or more small tanks would be best, for passenger service, a few larger tanks would be more economical.

The use of so called "instantaneous" water heaters, attached to each tap is not practical or economical. The expense of supplying so many heaters, their large electrical demands, and the slow rate at which hot water could be drawn are serious drawbacks.

It should be noted that, like the "booster" air heaters, an electrical hot water system can augment or "boost" whatever heat is obtainable from the exhaust or cooling water.

#### Finding Heater Sizes

Estimates of the size of electric water heaters needed for any particular service can be worked out easily. It requires about 2.5 watt hours to raise one gallon of water 1 degree Fahr. Bath temperature is about 105 degrees Fahr. and wash water (culinary) about 170 degrees Fahr. The efficiency of a well lagged storage system is 90 per cent or above. No electrical hot water system should be installed without careful lagging of tank, heater, and all hot water piping.

In the steward's department of a diesel engined vessel, radical changes have been successfully made that eliminate the necessity of carrying special galley fuels.

Coal has been almost universal galley fuel. When oil began to be burned under steam boilers, attention was drawn to the use of oil as a galley fuel. An intense heat can be obtained, but without good control. The oven temperature can not be adjusted without affecting the surface temperature. Maintenance is very high due to the erosive flames and high combustion temperature. When oil is used, steam must be supplied to atomize and pre-heat the fuel. This means oil and steam lines into the galley. Oil as a galley fuel has not been generally satisfactory or adopted.

Electric galley ranges have been built for many special applications during the

past 15 years. Steady advances in the art have produced electric ranges that meet every cooking requirement. The heat can be readily and quickly controlled, the oven temperature is independent of the surface temperature, excessive heat and the resultant high maintenance costs are eliminated. The working conditions in a galley are materially bettered and fire risk in rough weather eliminated.

Annoying ventilation problems that often occur in locating a galley are not present with electric ranges. No special ventilation is needed, as the ranges consume no oxygen and give off no gases.

For a simple galley for a small crew, one or more sections of electric ranges together with a source of hot water is all that is needed.

On a more elaborate scale, separate baking ovens, griddles, toasters, etc., allow the division of labor on the most economical plan, and the placing of the various pieces of equipment where most efficient service can be rendered.

The hot water supply of the galley can be taken care of by the general system or made independent of it. Where steam is required, for sterilization in dish washers, or in vegetable cookers, etc., an electric steam boiler can be used.

As the size of diesel engined vessels grows, the electrical industry can easily produce apparatus to fill the needs.

As a guide to the power required for galley electrification the following figures will be of interest.

Number fed	Kilowatts
	Connected Load.
0 .....	10
10 .....	25
25 .....	75
75 .....	200
200 .....	Over
Passenger Liner	15 .. 30 per 100 fed.

The daily consumption of energy per person fed will vary from one to three kilowatt hours per day, the lower figure being for group feeding and the higher for more elaborate service.\* (See note.)

The "maximum demand" or greatest instantaneous requirement of power by an electric galley will be 55 to 60 per cent of the figures given in the table and will usually come at a time when

\*While subject to wide variations, an average of one pound of coal per day per person fed might be assumed. Comparing this with one kilowatt hour per person per day, and the oil rate of the generating equipment, a cost comparison can be made. However, the greatest advantages of electric galleys lie in labor saving and lower maintenance, though often a direct fuel economy may result.

other demands are low, that is, in the early morning.

A trend is found in the case of large vessels to couple the several diesel units electrically to one or more propelling motors. In such designs, the power required for auxiliary uses of electricity can be taken from the main source. This would probably make possible the generation of a kilowatt hour of electricity for 0.6 pound of oil, figured from marine allowance of 0.4 pound per indicated horsepower for diesel vessels, including auxiliaries—or one half of the best steam figures.

Where electric generators are driven by auxiliary diesel engines, the pounds of oil per kilowatt hour will be 0.75 and upward, depending on size, efficiency, etc.

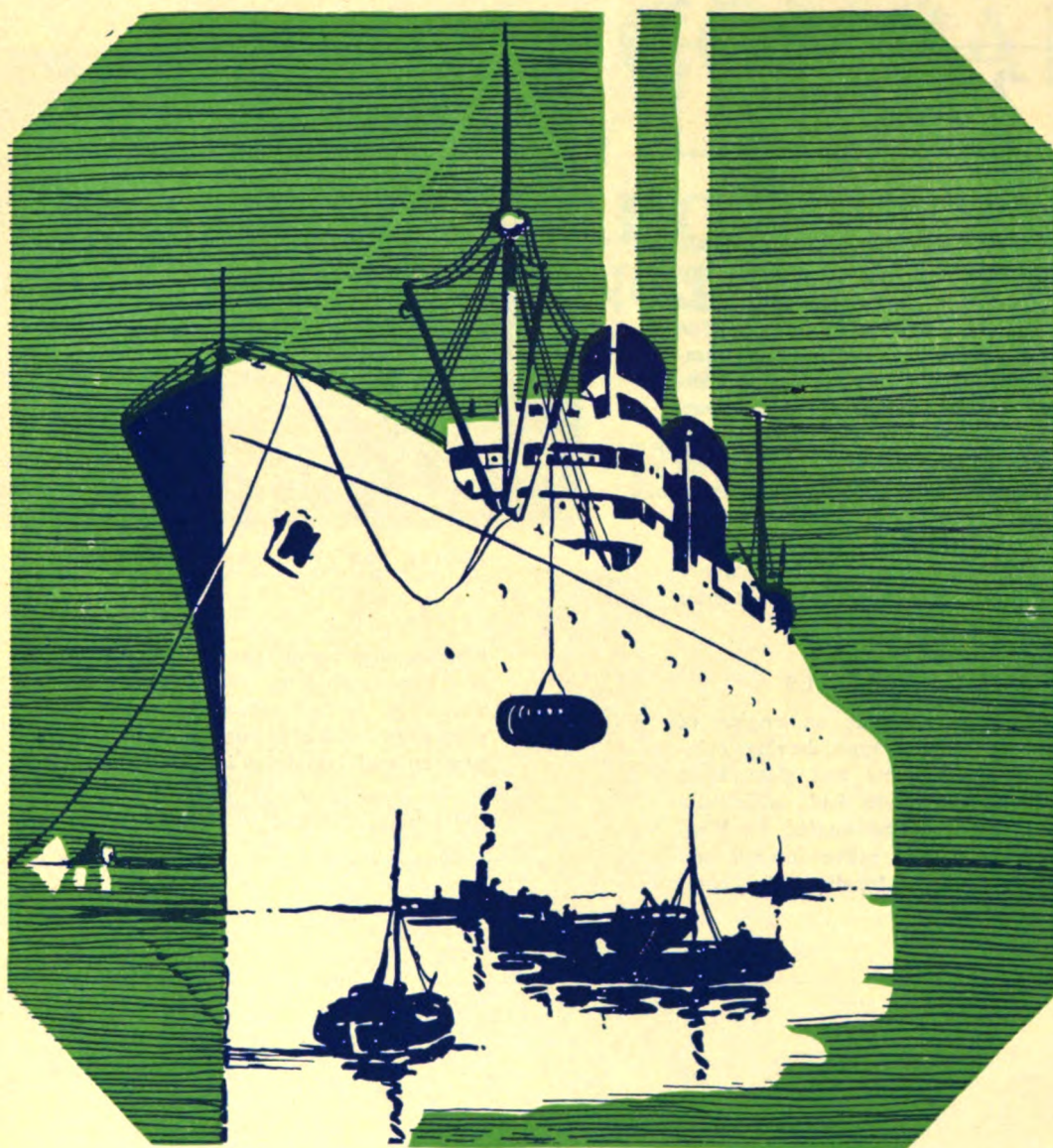
#### Saves Stand-By

The choice of size of auxiliary generators will depend on many factors—no set rule may be given. Comparative data from existing vessels together with a careful study of the time factor of the various pieces of equipment will enable the designer to set reasonable limits on the sizes of the machines. The diversity or variation in the time of individual maximum from the combined maximum demands will be considerable.

One of the most progressive marine architects has been far sighted enough to consider the electrification of auxiliaries from an angle not obvious to a superficial study. Stand-by costs in port are often a considerable expense. He designed the electrical system of a passenger liner so that when it is tied up for a long period, electricity could be purchased from the company supplying the pier and the generators on the ship shut down. Thus the lights, signals, winches, pumps, fans, galleys, etc., could be taken care of without a large engine room crew standing by. This comment is a strong plea for careful consideration of standards in voltage and design of marine equipment.

Elmer Walter and Charles Sullivan, radio operators on the passenger liner *BOSTON* at the time of her collision with the tanker *SWIFTARROW* off Montauk Point, July 21, have received a medal from James G. Harbord, president of the Radio Corp. of America. The medal, which carries an honorarium of \$100, is awarded by the Radio company for meritorious service.

Purchased in England for service along the British Columbia coast, the new steel steamer *ROBERT H. MERRICK* has arrived safely. The *MERRICK* is a 500-ton vessel built especially for coasting in Pacific waters. She is owned by the Frank Waterhouse Co. of Canada.



**Marine-Progress Diesel-Electric**

Insert section of the

**DECEMBER ISSUE**

# Marine Review

**New York**

**London**

**Cleveland**

# Uses Opposed Piston Design

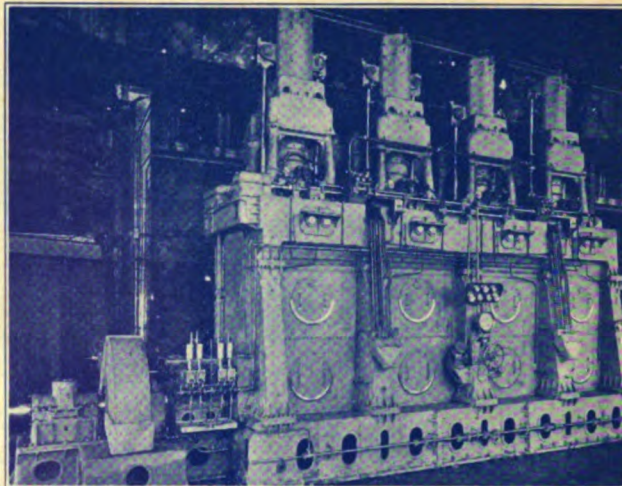
## 2-CYCLE OPPOSED PISTON

### Record of Builder

The Sun Shipbuilding & Dry Dock Co., Chester, Pa., has been successful in operating a large shipyard, ship repair plant, drydocks and engine building plants. It has filled a number of important contracts for passenger and freight vessels since the war. As a practical means of showing the economy of its diesel engines, this company purchased several large steamships and converted them to diesel drive with marked success. These ships are the tankers Miller County and Bidwell and the cargo carrier Challenger.

### Distinctive Features

This company builds an engine of the opposed piston type, having originally obtained plans and data from Wm. Doxford & Sons Ltd., which developed this type of engine in England. Two pistons move inward and outward together, forming the com-



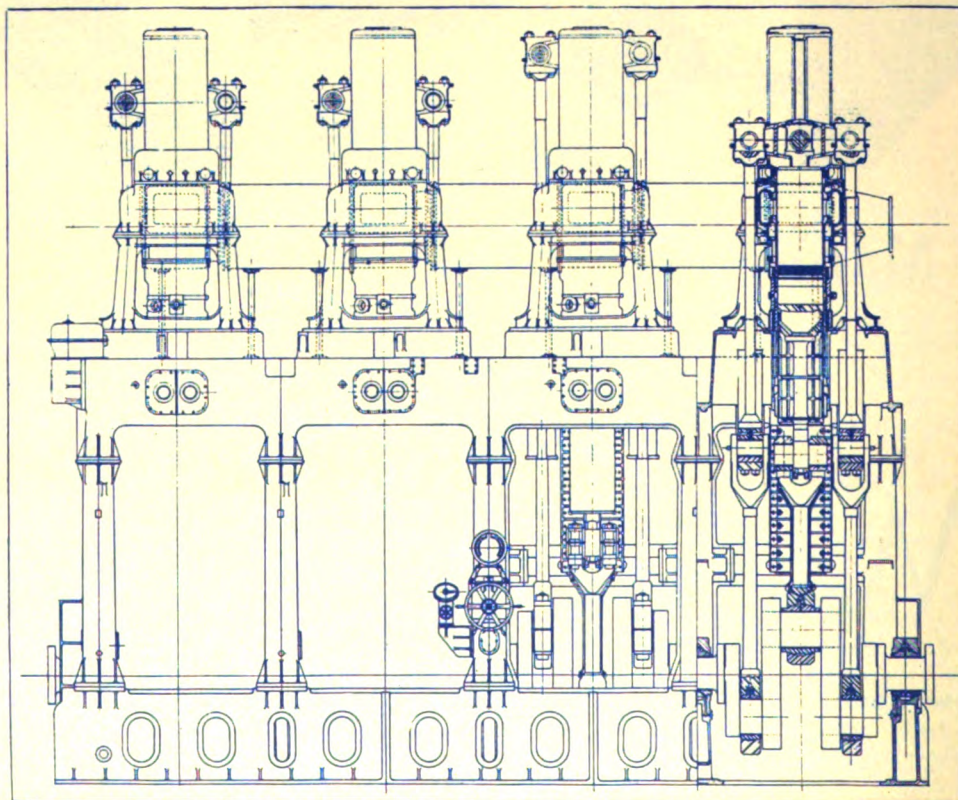
ENGINE FOR FORD LAKE MOTORSHIP

bustion chamber at their nearest point of approach. The advantages are simplicity, perfect scavenging, and the possibility of construction in large powers with small cylinder diameters.

### Type of Engine

These engines are of the 2-cycle type.

ELEVATION OF OPPOSED PISTON TYPE ENGINE



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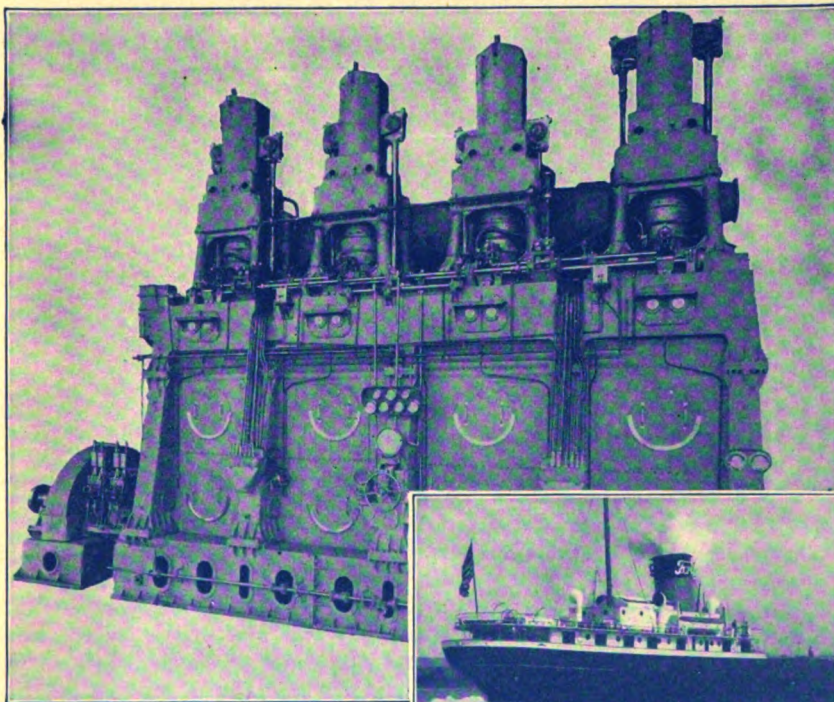


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# U. S. Has Lagged in Use of Diesel

Original Study of World Shipping Shows  
How Other Countries Have Taken Lead

By A. H. JANSSON

**O**N ACCOUNT of the very nature of the service required, dependability is by far the most important requirement for all mechanical appliances intended for use on board ship. This quality is nothing less than essential in all the mechanism that has to do with the propulsion and safe navigation of the ship. Simplicity in design and operation is a function of dependability as it reduces the possibilities of failure due to carelessness, lack of judgment or insufficient training on the part of the personnel. Machinery complicated in design, involved in principle and delicate in construction, requiring the utmost care and attention and exceptional skill in op-

tween steamship lines and shipbuilding and marine engineering companies abroad, no doubt accounts to a great degree for this condition. In the case of the adoption of the diesel type of power and electrification of auxiliaries, the United States has been so far, outdistanced by several of the countries in Europe.

This apparent backwardness on the part of the United States may be laid to the factors outlined above exerting more than ordinary influence because of the invention and early development of the diesel engine abroad. Another cause is the fact that about 80 per cent of the privately owned American merchant marine is engaged in trade

the importance and significance of adopting this economical type of power if they are to keep up with the trend in this direction on the part of the more progressive nations, and to meet competition on a basis of parity in fuel costs and carrying capacity. Such activity also indicates an increasing degree of confidence in the dependability of this type of power with the result that serious consideration is now given to the merits of its application in every new vessel projected from tugs to ocean liners.

The progress made in the adoption of this type of power for the American merchant marine as indicated by recent examples of new vessels built,

Table I  
DIESEL ENGINED VESSELS IN MERCHANT MARINE OF EIGHT COUNTRIES

Country	THIS YEAR			No.	LAST YEAR		No.	TEN YEARS AGO	
	As of June 30, 1924				As of June 30, 1923			As of June 30, 1914	
	Number	Gross Tons	Av. Size		Gross Tons	Av. Size		Gross Tons	Av. Size
Great Britain .....	99	456,550	4612	79	348,516	4412	10	30,158	3,016
United States .....	82	186,458	2274	69	151,540	2196	8	10,316	1,290
Norway .....	73	193,903	2656	70	171,972	2457	2	2,878	1,439
Sweden .....	47	179,961	3829	42	150,268	3578	4	14,895	3,724
Denmark .....	39	167,439	4293	34	140,942	4145	10	49,249	4,925
Germany .....	37	122,596	3313	26	82,044	3156	10	45,733	4,573
Holland .....	29	58,996	2035	28	51,520	1840	6	14,097	2,350
Italy .....	28	78,365	2799	33	69,133	2095	2	1,113	557

eration is decidedly not suitable for marine installations.

That the ship shall have every reasonable assurance of reaching her destination on time and safely is the first concern of the operator or owner. Under highly competitive conditions such as have existed for the past three years and now exist, to be successful a ship must be economical in operation as well as dependable. So the steamship owner is now most anxious to secure economy but he is still extremely conservative and cannot afford to take any chances on dependability. This conservatism, this unwillingness to accept any new device or type of motive power before such have been thoroughly tried out time and time again in a practical way at sea appears to be more marked in the United States than in the leading maritime nations of Europe.

The greater influence accorded the highly trained engineer and the closer co-operation and interdependence be-

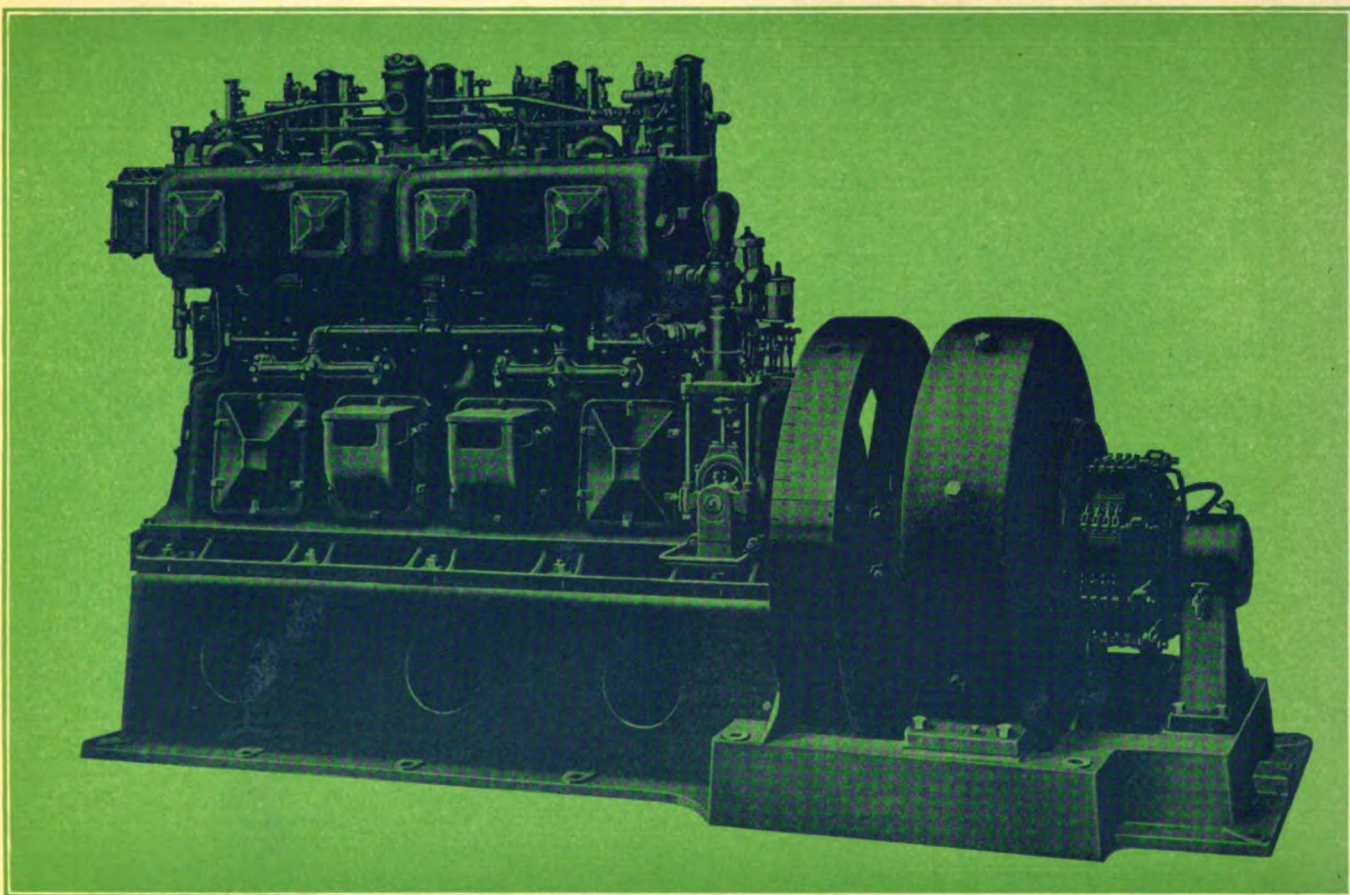
routes protected by the coastwise laws against foreign competition, and the remaining 20 per cent are protected by American influence in one way or another, for instance, where the ships are owned by large industrial concerns which find it to their best interest to operate them in certain trades even though at greater costs than foreign built and foreign flag ships could be operated. There is no such thing at present as direct competition on a free-for-all basis by privately owned American ships against foreign ships for the seagoing carrying trade of the world. Thus the same urgency in meeting competition has not existed in the United States as an impetus to the adoption of this type of drive.

Recent activity in the application of diesel engines for main and auxiliary power on merchant ships in the United States, however, is an indication that American steamship men have at last awakened from their lethargy and are now becoming thoroughly aroused to

and existing vessels converted, ought to convince every American steamship owner and operator that the use of diesel engines and electricity has come to stay and that a change from steam to diesel in many classes of vessels is inevitable. To ignore or attempt to oppose this irresistible search for economy is short-sighted and will only result in giving away an important advantage to other nations and individuals now fully alive to the favorable results to be attained.

Though the United States has now next to Great Britain the largest number of diesel vessels, an analysis of the world's merchant fleet equipped with this type of power shows that in average gross tonnage per vessel, this country ranks only seventh. The average size of the American diesel vessel as compared with the average size of such vessels in the merchant fleets of other nations is presented graphically

(Continued on Page 470)



## Generators— *Specially Adapted to Marine Diesel Engines*

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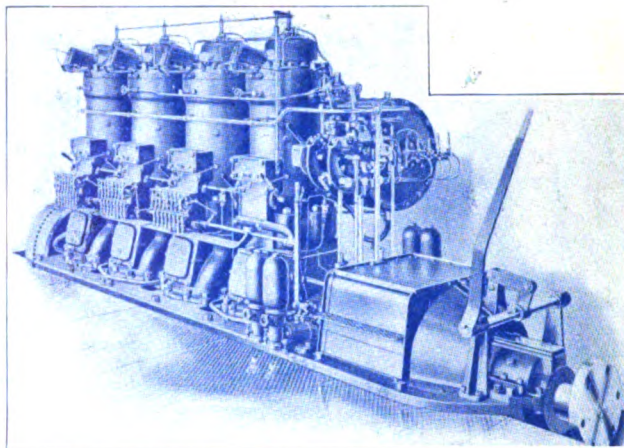
### 2-CYCLE SINGLE ACTING

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This engine is designed to run on the cheapest crude oil. It is planned to develop full power with a minimum of noise and vibration and to occupy the minimum of space. No reverse gear is used, the engine being directly reversible by preignition. Engineering progress by experimentation in the company's laboratories have met the problem of regulating the heat of the



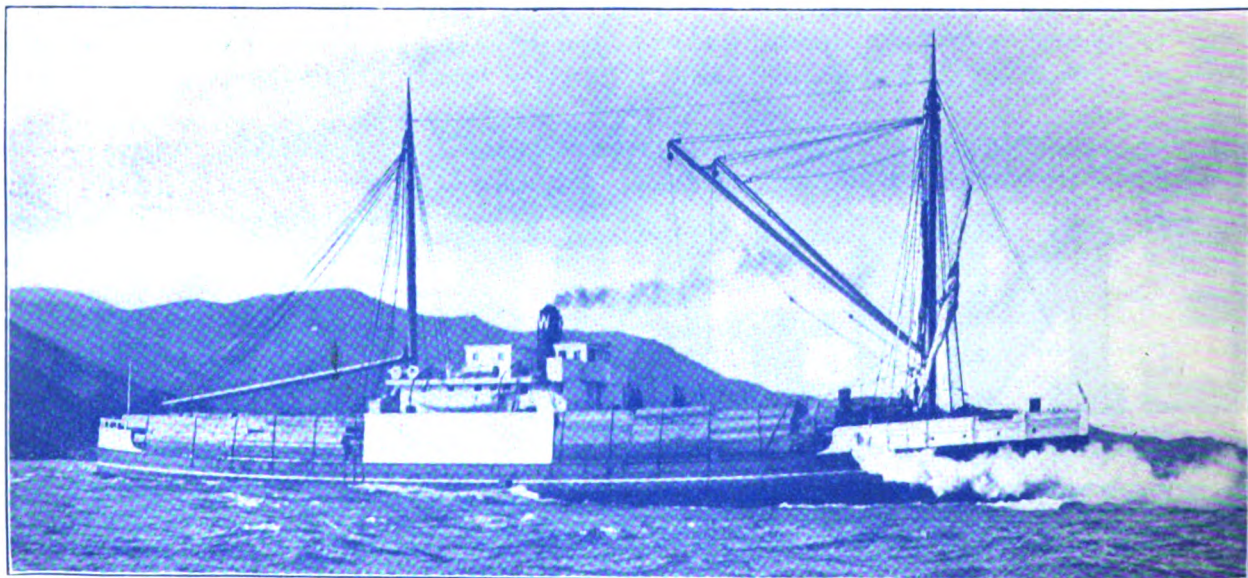
4-CYLINDER, DIRECT-REVERSIBLE

ignition bulb and piston, by eliminating both water and air injection and using a mechanical fuel spreader. The company's marine heavy oil engines are built in 4-cylinder sizes from 100 to 500 brake horsepower, in 2-cylinder sizes from 12 to 175 brake horsepower and in single cylinder sizes from 6 to 65 brake horsepower.

#### Type of Engine

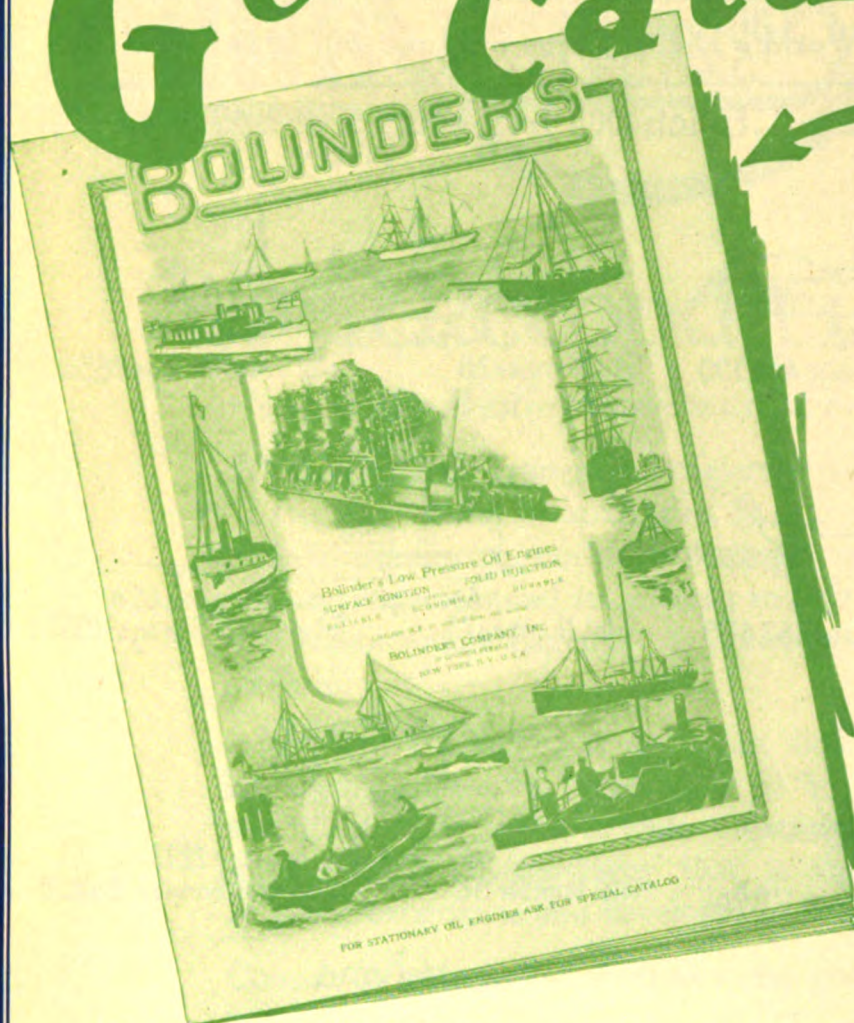
This engine is of the low pressure, surface ignition, solid injection type.

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(Continued from Page 466)

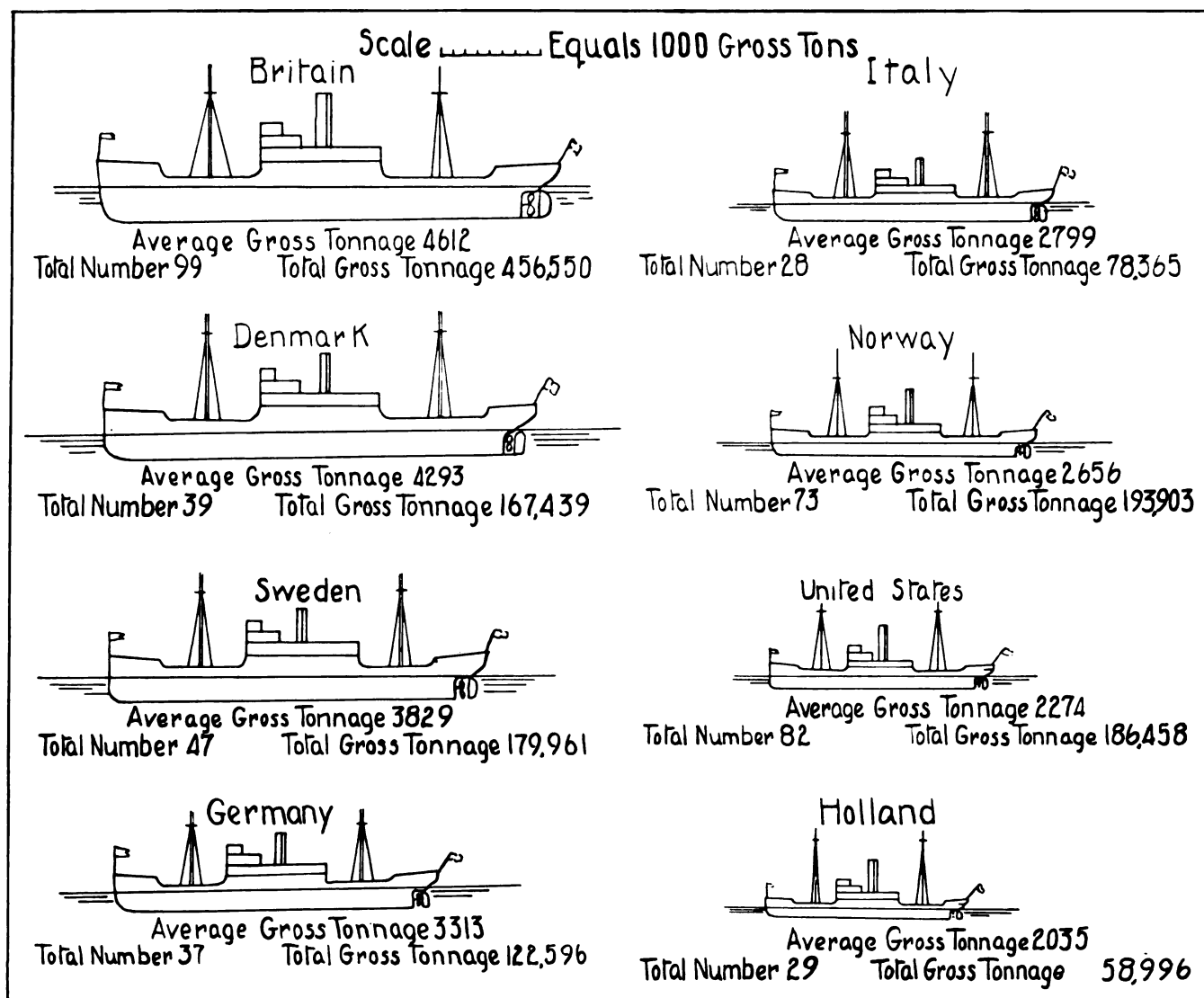
by comparative diagrammatic drawings to scale in the chart below.

The accompanying Table I lists the total number, total gross tonnage and average gross tonnage per vessel as of June 30, 1924, June 30, 1923 and June 30, 1914, of the merchant ships equipped with diesel power in the eight nations, which at present lead in its application for marine installations. A study

ing the absolute necessity of keeping abreast of the times, authorization by the last congress of the expenditure of a sum not to exceed \$25,000,000 for the dieselization of government merchant steam vessels and the recent initial, tentative award of contracts for main engines to convert 18 such vessels is a step likely to have the greatest importance in building up an efficient merchant marine. The further

to be contracted for in the near future is comparatively small. Secondly, as the vessels of this type are practically all for domestic commerce, competition against other vessels so equipped is not a factor at present. However, that serious consideration is now given to the use of diesels in vessels of this character, is indicated by the discussion of the use of such power in the projected large Matson liner and the

### Average Size of World's Diesel Ships on June 30, 1924



of the size and type of American sea-going vessels, 500 gross tons and over equipped with diesel engines, shows that this country is far behind the leading maritime nations in medium and large sized freighters and that no attempt so far has been made to apply this type of power to passenger vessels, of any size. In Table II, a detailed analysis of American diesel ships shows the preponderance of smaller vessels and also that a large number are wooden hulls.

In view of this situation and realiz-

proviso in this act allowing loans from the construction loan fund to private owners and operators for the conversion of existing steam vessels to diesel drive as well as for the construction of new vessels should be of great aid in promoting a steady increase in the American diesel fleet of larger freight ships and tankers.

The actual adoption of the diesel engine in American passenger vessels still seems remote. In the first place, the number of new vessels of this type recently contracted for or likely

Southern Pacific passenger vessel, the BIENVILLE, though in neither case, was finally adopted. Plans and specifications have also been prepared for two diesel drive passenger vessels for the Panama Pacific line, between New York and San Francisco.

Through licenses from several of the foremost European diesel engine builders and through independent engineering research and development work, American shipyards and engine builders are now fully able to meet any

(Continued on Page 514)



# When Reconditioning

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THE established superiority of electric power, whether for propulsion or auxiliaries, is everywhere recognized in the marine world. Its flexibility, simplicity, and economy have assured its success; and to that success, the Westinghouse Company has contributed in a large measure.

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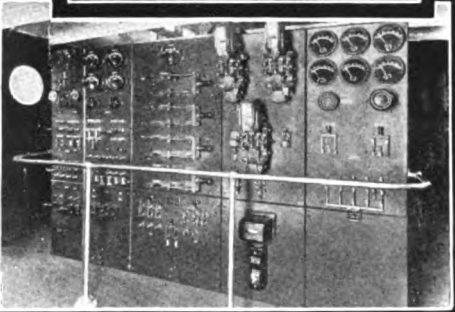
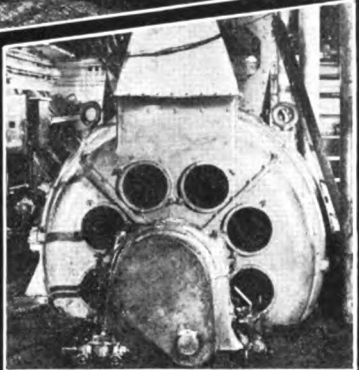
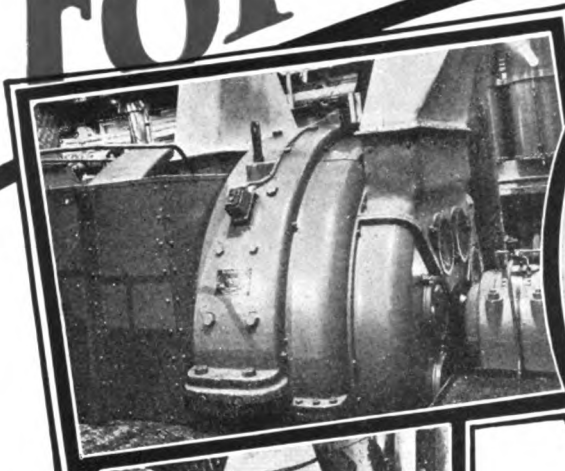
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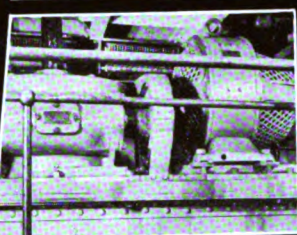
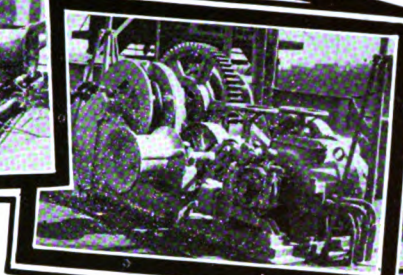
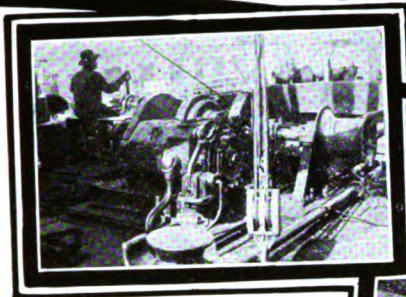
THE United States Army Hopper Dredge A. Mackenzie is the first ship that ever went to sea without the need for fire aboard. Every mechanical operation, from cooking to propulsion, is done by electricity.

All the main electrical equipment on this dredge and her three sister ships was supplied by the Westinghouse Company. Her 700 kw. Diesel-driven generators, her 800 hp. propelling motors, her deck auxiliary motors, and her flexible system of control are all products of Westinghouse marine engineering experience.

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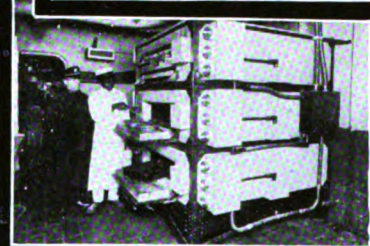
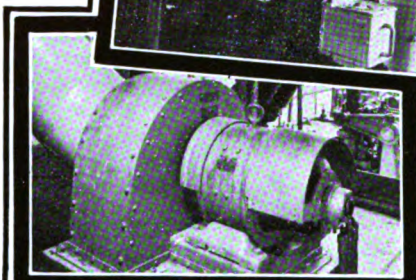
This 8,000 ton tanker will be propelled by a 2300 s.h.p., 750 volt, direct-current Westinghouse double-armature motor, driving the single screw at 100 r.p.m., with power for propulsion and the ship's use supplied by three 600 k.w., 250-volt Westinghouse generators and three 50 k.w. exciters. The below deck auxiliaries will be Westinghouse motorized and controlled.

The *Challenger*, converted to direct Diesel drive, is equipped above and below deck with Westinghouse generators, motors and control.

The U. S. Shipping Board's first motorship, the *Wm. Penn.*, the motorships, *Californian* and *Seekonk*, are equipped with Westinghouse motors and control for the deck auxiliaries. Similar Westinghouse motors and control will be installed on the Clyde Line steamers *Cherokee* and *Seminole*.

Other Westinghouse installations on Diesel electric ships with pilot house control include the following: *J. H. Senior*, tanker; *P. R. R. No. 16* tug; *Poughkeepsie* ferryboat; *J. B. Battle*, stern wheel towboat; dredges, *A. McKenzie*, *Wm. T. Rossell*, *Dan C. Kingman*, *A. L. Marshall*; yachts, *Guinivere*, *Elfay*, *Valero II*, *Alcyone* and *Cutty Sark*, and the electrical equipment of the dredges *Gulfport*, *Allegheny*, *Port of Portland* and *Norfolk*.

Westinghouse Electric & Manufacturing Company  
East Pittsburgh Pennsylvania  
Sales Offices in all Principal American Cities  
Service Stations in Principal American Ports  
Special Pacific Coast Representatives  
Hunt, Mirk & Company, San Francisco



# Westinghouse



# Service

To serve the purchaser of marine apparatus, the Westinghouse Company has installed completely equipped service shops in principal American ports. It has provided facilities for quick repairs on shipboard in cases of emergency. It has expert engineers detailed to work on repairs. In these and many other ways, it has accepted the obligation of service to the purchaser. An idle ship means money lost. Consider the facilities for service behind the apparatus as well as the purchase price.

## Service Stations

Baltimore, Md., 501 East Preston Street  
Boston, Mass., 12 Farnsworth Street  
Buffalo, N. Y., 141-157 Milton Street  
Chicago, Ill., 2201 W. Pershing Road  
Cincinnati, Ohio, Third and Elm Streets  
Cleveland, Ohio, 1255 West Fourth Street  
Detroit, Mich., 1535 Sixth Street  
Los Angeles, Cal., 420 S. San Pedro Street  
New Orleans, La., 1208 South Rampart Street  
New York, N. Y., 467 Tenth Avenue

Philadelphia, Pa., 214-220 North 22nd Street  
Philadelphia, Westinghouse Electric and Manufacturing Company, South Philadelphia Works  
Pittsburgh, Pa., 6905 Susquehanna Street  
Providence, R. I., 393 Harris Avenue  
St. Louis, Mo., 717 South Twelfth Street  
San Francisco, Cal., 573 W. Second South St.  
Seattle, Wash., 3451 East Marginal Way

## Westinghouse Marine and Shipyard Apparatus

Air Heaters  
Air Ejectors  
Ammeters  
Arc Lamps  
Arc Welding Equipments  
Automotive Electric Equipment  
Battery Charging Panels  
Circulating Pumps  
Condensing Equipment  
Control Apparatus  
Cooking Utensils, Electric  
Crane Motors  
Dead Front Safety Fuse Panels  
Deck Winch Motors and Control  
Diesel Electric Propelling Equipment  
Drills, Electric Hand Operated  
Electrically Heated Hot Tables  
Elevator Motors and Control  
Fans, Ceiling, Desk and Bracket  
Flood Lighting Projectors  
Geared Turbine Propelling Equipment

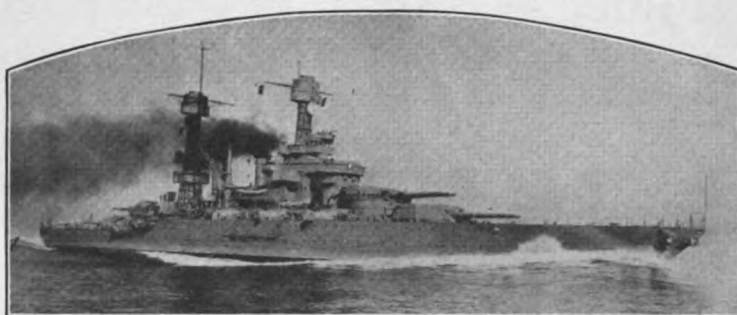
Generators up to 45,000 Kw.  
Glue Pots, Electrically Heated  
Heaters, Electric  
Industrial Haulage Trolleys  
Instruments—Electrical  
Industrial Heating Devices  
Insulation Material  
Insulators  
Lamp Sockets, Shades and Brackets  
Lighting Fixtures  
Lightning Arrestors  
Locomotives—Baldwin-Westinghouse  
Machine Tool Motors  
Melting Pots  
Meter Panels  
Meters—Electrical—All Types  
Micarta  
Motor-Generators—All Sizes  
Motors for All Ship and Shipyard  
Applications 1-50 to 45,000 H. P.  
Panel Boards

Planer-Motor Equipments  
Portable Electric Grinders  
Pump Motors  
Relays  
Resistors  
Rheostats  
Safety Apparatus, Electrical  
Small Turbines for All Needs  
Solder Pots, Electrical  
Starting Switches  
Steering Gear Motors  
Stokers  
Substations, Outdoor  
Switchboards  
Transformers, All Types  
Transmission Line Fittings  
Turbine Electric Propelling Equipment  
Ventilating Equipment  
Water-tight Motors and Control for  
Deck and Engine Room

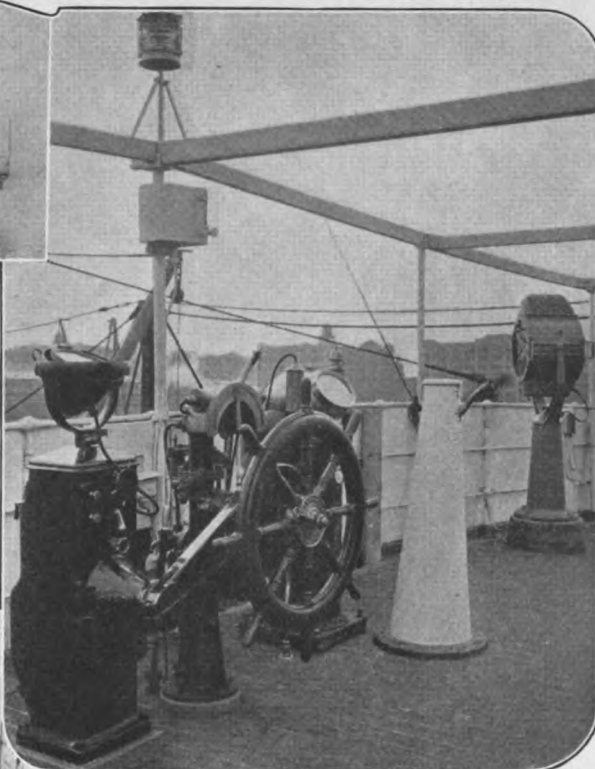
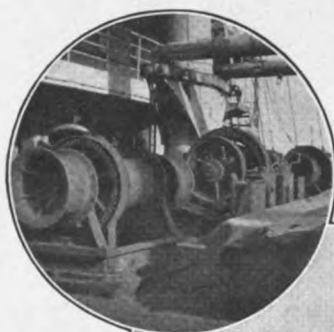
Westinghouse Electric & Manufacturing Company  
East Pittsburgh, Pennsylvania  
Sales Offices in all Principal American Cities  
Service Stations in Principal American Ports  
Special Pacific Coast Representatives  
Hunt, Mirk & Company, San Francisco

# Westinghouse

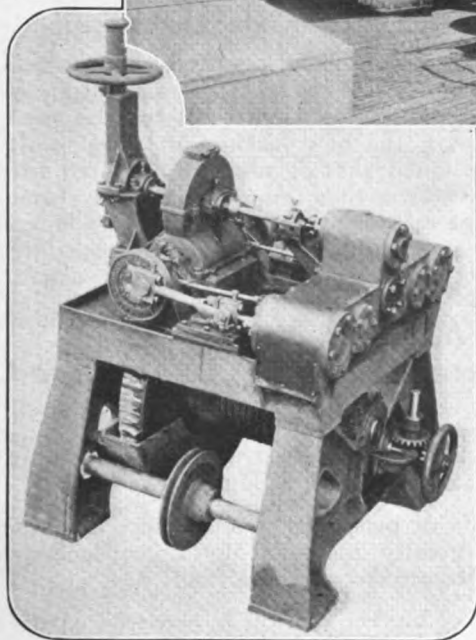
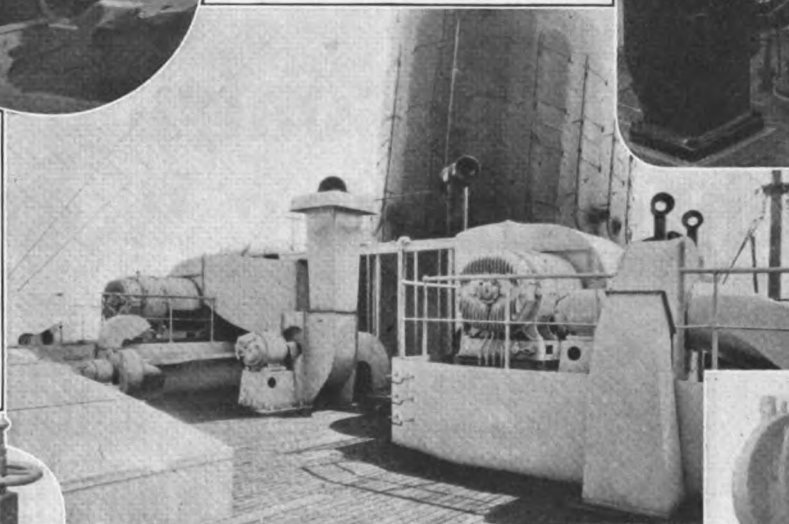
# Many Uses Found for Diesel Electric Equipment



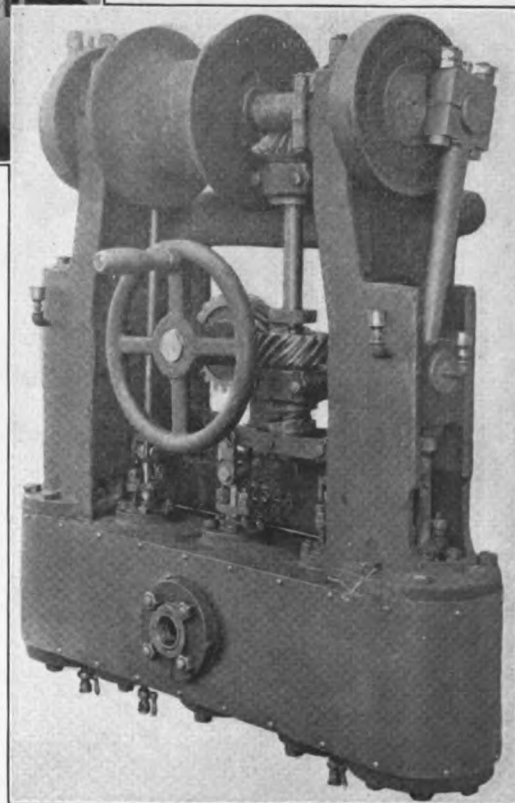
Electric driven superdreadnaught developed by this country. At left, electric control for heavy cargo winch

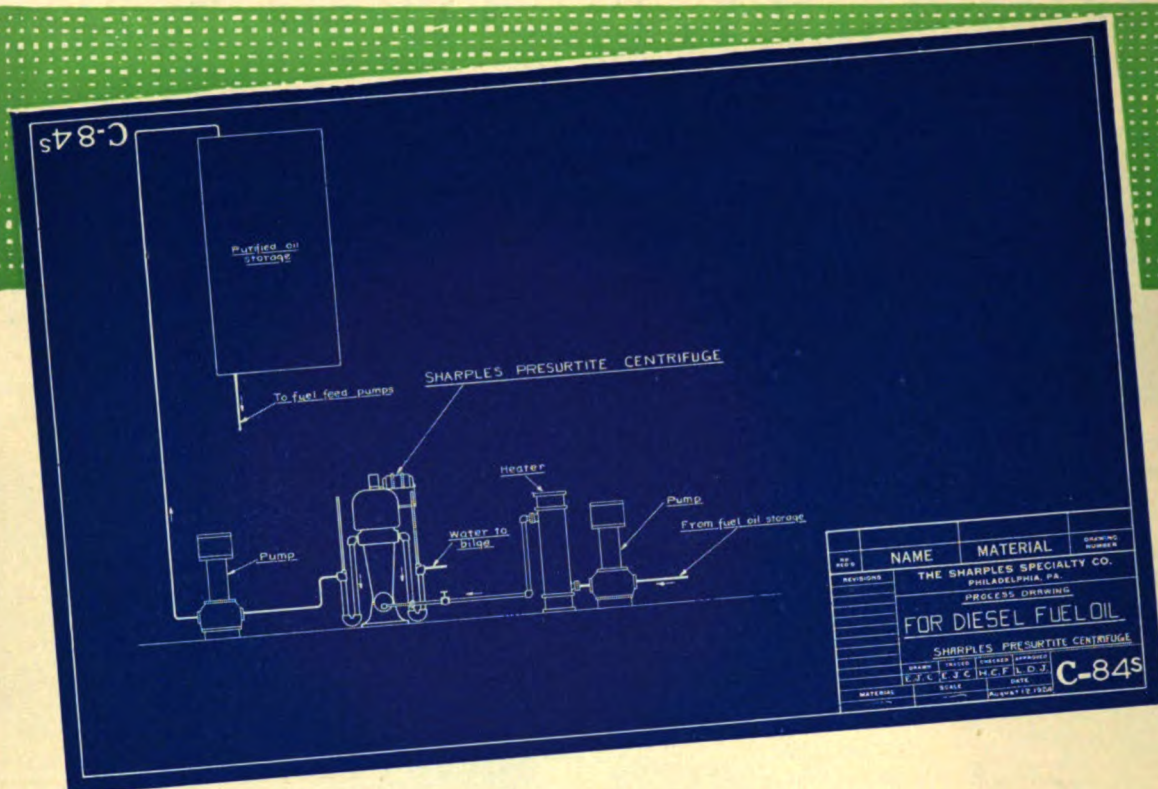


Sperry gyro-pilot, or mechanical steerer and powerful searchlight



Blowers on Leviathan driven by Diehl type motors. At left, drum type steerer and at right automatic ash hoist, both built by Maine Electric Co.





## A new SHARPLES contribution to the Marine World



Again Sharples Centrifugal Engineers have made an important contribution to the Marine World in the new

### Sharples Presurtite Super Centrifuge For Cleaning Fuel Oil for Diesel Engines

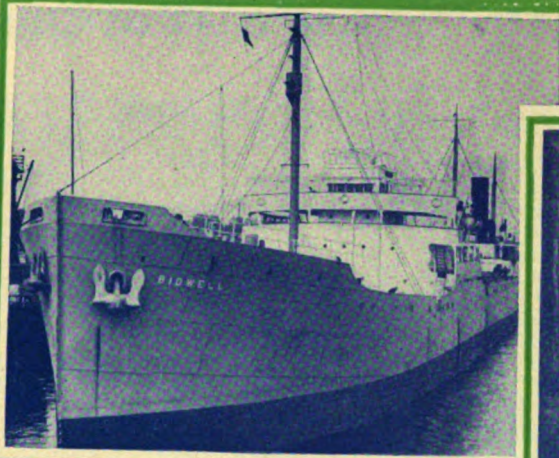
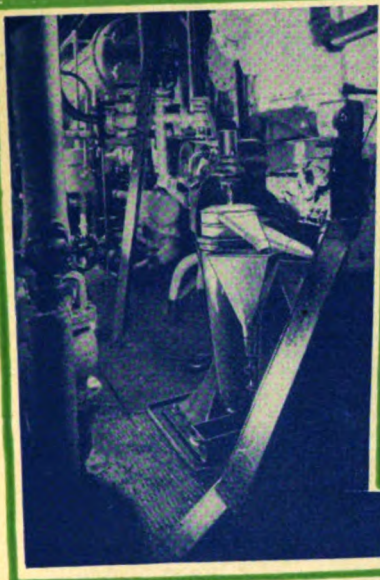
Every owner and operator of Diesel-powered ships will be interested in this new model for it combines the well-known advantages of the Sharples Super Centrifuge for the treatment of Diesel fuel with the new feature of being totally enclosed. It is so designed that it may be operated in a system under pressure. It is thus impossible for any fumes to escape from the hot oil during treatment. For the first time Diesel fuel can be centrifugally purified at the elevated temperature required for best results—and with absolute safety.

### What The New Sharples Presurtite Super Centrifuge Will Do

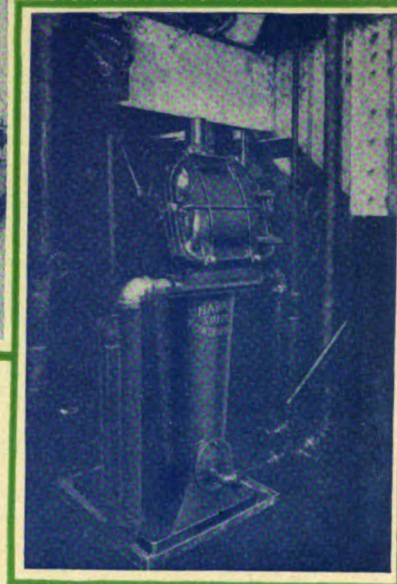
The Sharples Engineers have demonstrated two important points with the standard open type Super Centrifuge:

- 1 — That the life of piston rings and liners in Diesel Engines is greatly increased by Sharples Super Centrifugal treatment of Diesel fuel.
- 2 — That ordinary bunker fuel oil is rendered entirely satisfactory for Diesel fuel by Sharples Super Centrifugal treatment.

Please mention MARINE REVIEW when writing to Advertisers



Illustrations show Sharples Super Centrifuge and Sharples Presurtite Super Centrifuge installed on S. S. "Bidwell."



To get really satisfactory fuel from heavy oils it is, however, necessary to heat the oil above its flash-point. Attempts at partially enclosing a Sharples Super Centrifuge, by using vapor traps and other similar precautions, reduced the escape of vapors from the system but did not entirely eliminate this undesirable feature. The complete answer to this objection is the Sharples Presurtite Super Centrifuge.

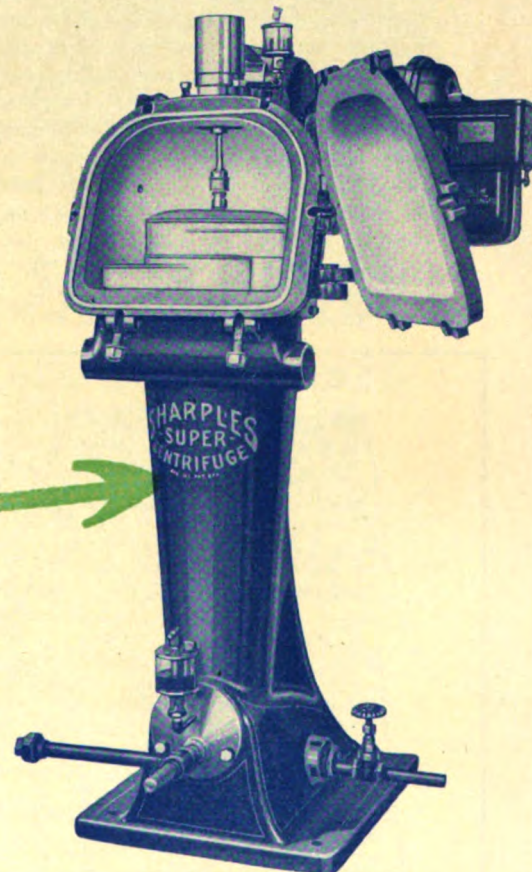
\* \* \*

The advantage of removing, by centrifugal treatment, the ash-forming abrasive material and water from Diesel fuel is well understood by Diesel engineers. Compared with the cost in outlay and delay in repairing the engine, the installation and operation costs of the Sharples system are insignificant. The economic advantages of using the cheaper bunker fuel for Diesel engines have only just been realized. The Chief Engineer of the "Pacific Shipper" is authority for the statement that the saving in fuel cost alone made possible by the Super Centrifuge pays for the Sharples installation in one trip from England to California and return.

In addition to this saving in cost it is an important advantage to be able to purchase almost any grade of fuel oil anywhere in the world with full confidence that the Sharples system absolutely protects the Diesel engine.

\* \* \*

Sharples Engineers have complete and important data on this application of Sharples Super Centrifugal Force which they are glad to send to anyone interested in Diesel Engines.



The New Sharples Presurtite Super Centrifuge

It is an entirely new model—completely enclosed—absolutely airtight. All the important basic and major advantages and centrifugal features contained in the standard Sharples Super Centrifuge are retained. The Sharples Super Centrifuge not only purifies Diesel fuel, but also reconditions all lubricating oils.

## THE SHARPLES SPECIALTY COMPANY

2300-2338 Westmoreland Street Philadelphia

Representatives in all principal industrial territories

Please mention MARINE REVIEW when writing to Advertisers

# Easy to Remove Working Parts

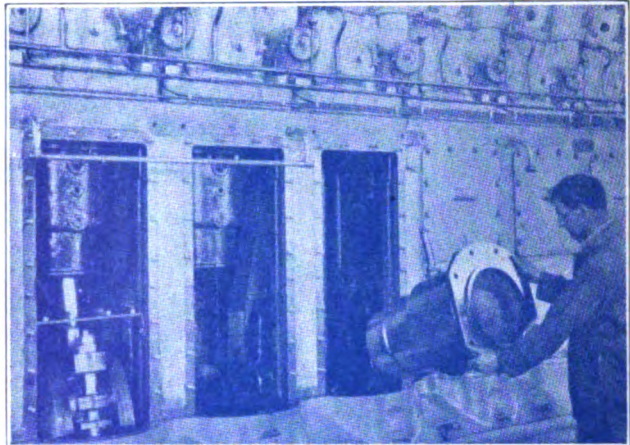
## 4—CYCLE SINGLE ACTING

### Record of Builder

The Lombard Governor Co., Ashland, Mass., has been active in manufacturing for 30 years and has established a reputation for the quality of its waterwheel governors, remote control apparatus and recording instruments. It began the manufacture of its diesel engine about a year ago when the first installation was made.

### Distinctive Features

This engine embodies no radical changes, following approved diesel practice but it does measure the advance in the art through its simplified design, reduced weight and such features as improved cylinder construction for better cooling and reduction of stresses, pressure-stream lubrication to all bearings, improved accessibility for quick inspection of all working parts. On shipboard, where space is at a premium, accessibility counts and this engine needs no space beyond that actually occupied by the engine, for removing cylinder heads and with-



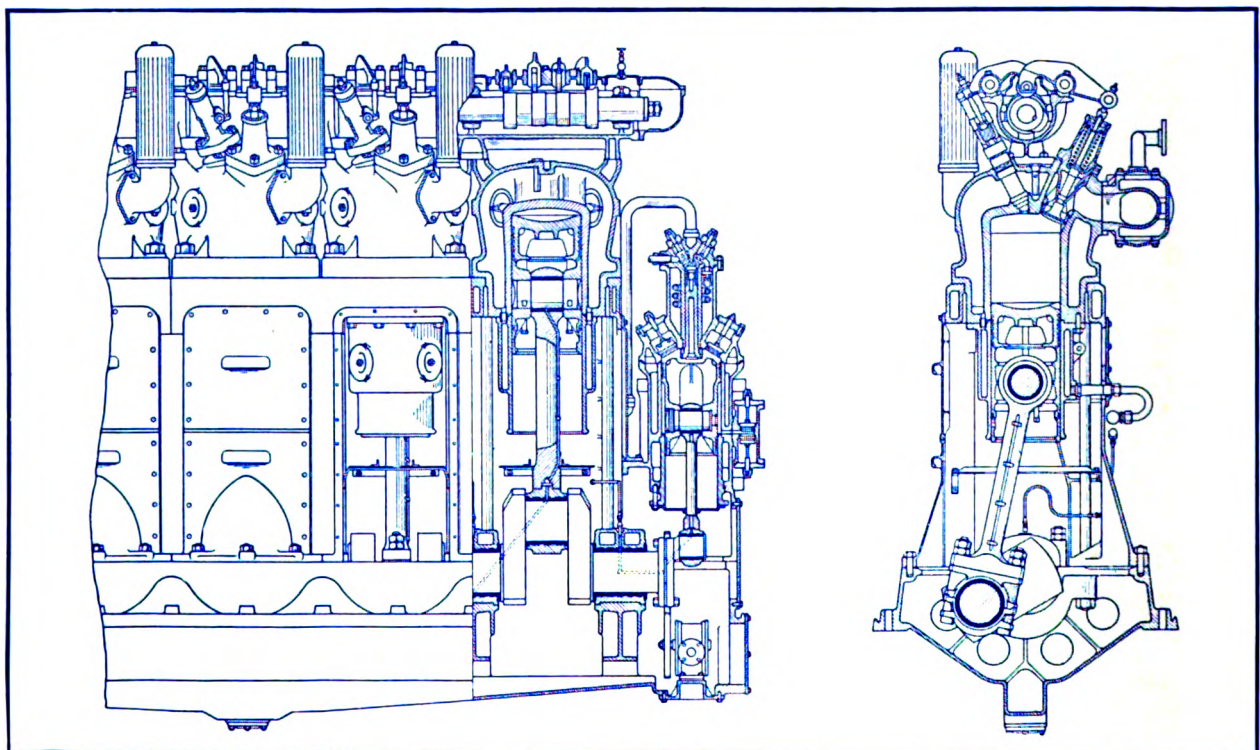
METHOD OF HANDLING PISTONS AND CONNECTING RODS

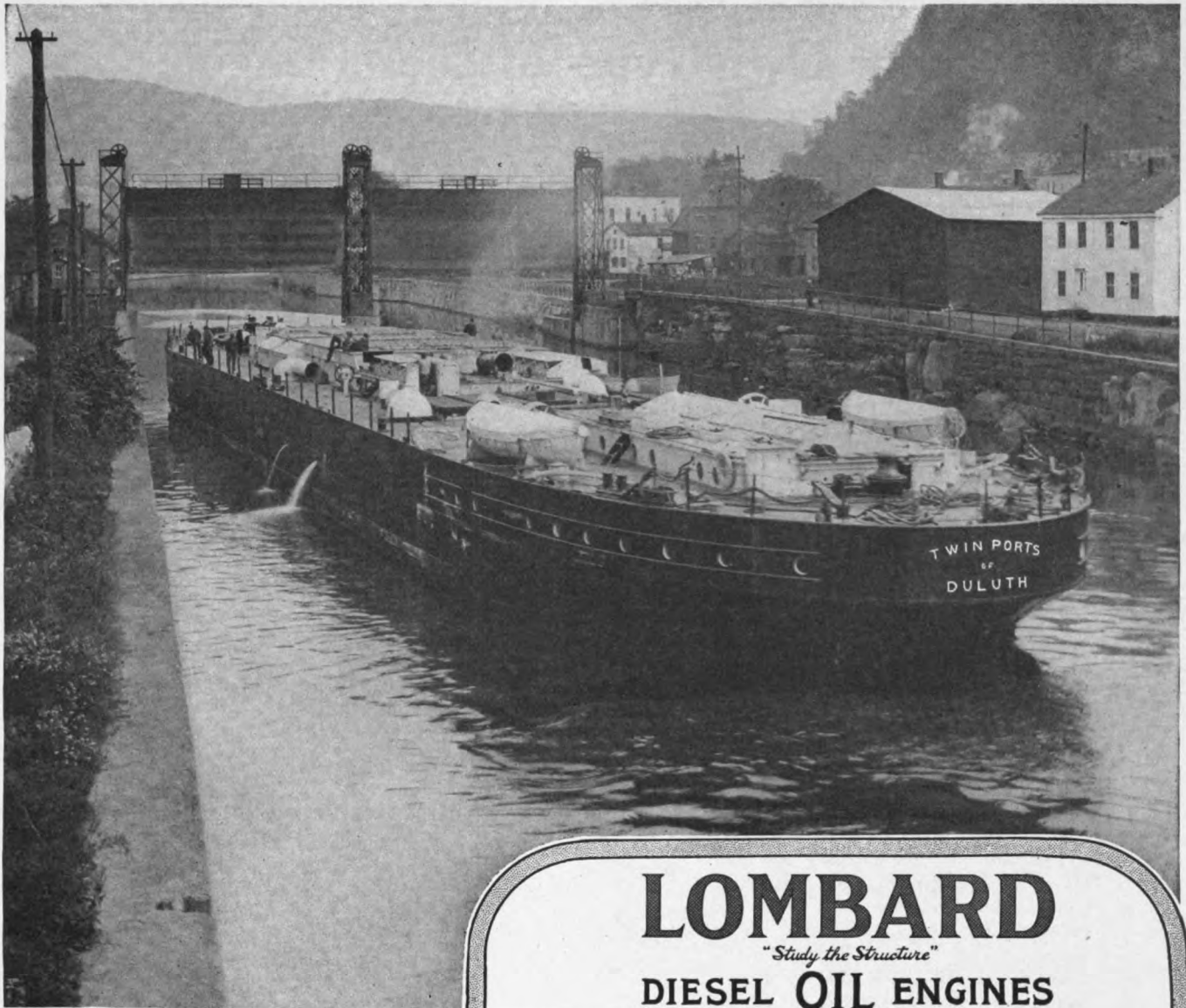
drawing pistons. These engines have been run on residue fuel oil of as low as 14-16 degrees Baume. Separate lubrication for cylinders and pistons is not necessary. The camshaft is located overhead.

### Type of Engine

These engines are built in 3, 4, 6 and 8-cylinder models, the 6 and 8-cylinder types being direct air reversing. The range of sizes is from 100 to 600 brake horsepower.

ELEVATION OF ENGINE AND TRANSVERSE SECTION THROUGH WORKING CYLINDER





## LOMBARD

*"Study the Structure"*

### DIESEL OIL ENGINES

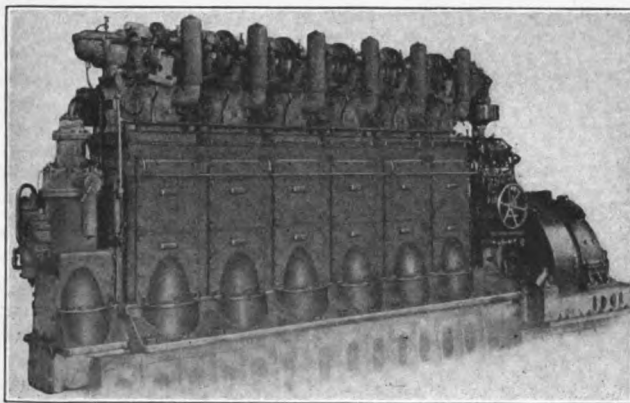
—set a new standard of accessibility, save weight and headroom, and are notable for their practical simplicity and convenience.

The crank case is completely enclosed to retain and return for repeated use the lubricating oil of the pressure-stream circulating system. Yet—the whole front of the engine can be quickly opened up—climbing into crank case is unnecessary.

The cam shaft is mounted centrally on the cylinders to reduce the valve gear to simple rocker levers. Cylinder-and-head joint is eliminated to obtain unobstructed water circulation over cylinder top and around the valve ports. Yet—any piston can be withdrawn and with its connecting rod swung out through front of engine at great saving of time and without disturbing adjustments.

THE LOMBARD GOVERNOR COMPANY

*Established 1894*  
Diesel Engines and Water Power Governors  
660 MAIN STREET, ASHLAND, MASS.



One of the 250 KW Electric Drive Sets of  
The McDougall Terminal Warehouse Company's  
"Twin Ports" and "Twin Cities"

**The Lombard design pleases  
Owner and Operator**

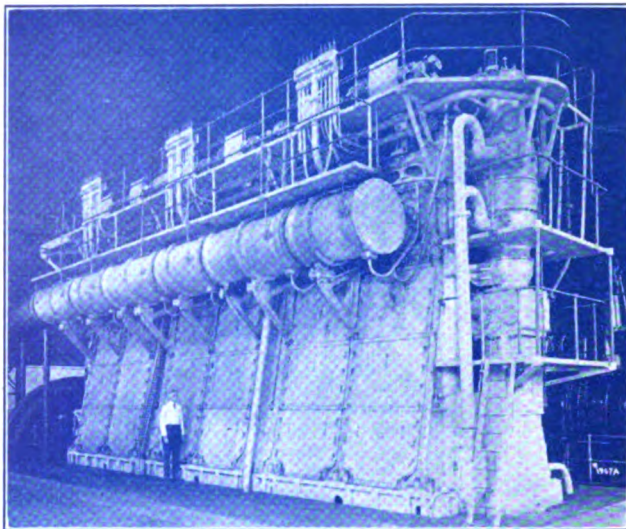
Please mention **MARINE REVIEW** when writing to Advertisers

# Designs Own Type of Diesel Engine

## 2-CYCLE SINGLE ACTING

### Record of Builder

The Bethlehem Shipbuilding Corp., a subsidiary of the Bethlehem Steel Co., Bethlehem, Pa., is one of the largest ship constructing and engine building companies in the world. It operates a large number of ship building and repairing plants on both the Atlantic and Pacific coasts and has had a thorough experience in building vessels of all types, from the smallest types up to the largest passenger ships and superdreadnaughts. In its steel mills, as well as on its own fleet of ships, the company's engineers have had unusual opportunities for studying steam, gas and oil engine design and operation. This fact was of great value in the design of its own oil engine which has been in successful operation both for hard steel mill service and in its ore carrier, the Cubore. At the present time, the company is installing its engine in the tanker Lio, being converted from steam for the General Petroleum Co. This vessel will have the company's large unit type, 6-cylinder oil engine and three Bethlehem-Trout type heavy oil engines.

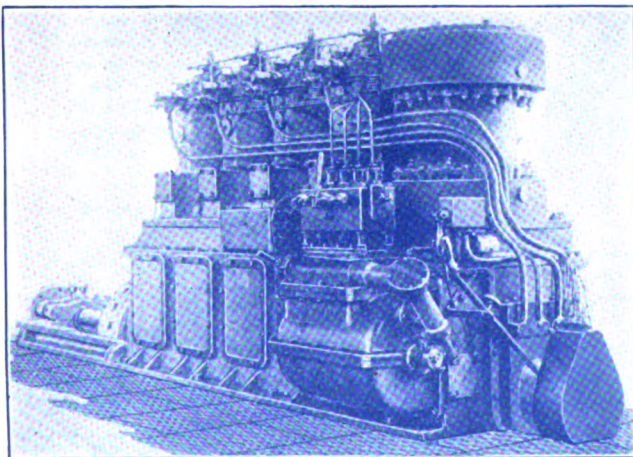


6-CYLINDER BETHLEHEM LARGE UNIT TYPE OIL ENGINE

### Distinctive Features

This engine is of purely American design. It is built in units of 4, 6 and 8 cylinders running at a speed of from 116 revolutions per minute for land power and twin screw marine purposes down to 90 revolutions per minute for single screw marine use. On the Cubore, this engine functions down to 20 revolutions per minute. All parts of the engine subject to flame temperatures are especially designed to meet such service. The power cylinder is free to expand in all directions without setting up stresses in any working part. All working parts except the piston are contained in a single, compact and readily removable cage. A simple device is furnished with the engine for removing the pistons from the bottom of the cylinders without disturbing any of the valve gear or piping on top of the engine.

4-CYLINDER BETHLEHEM-TROUT HEAVY OIL ENGINE

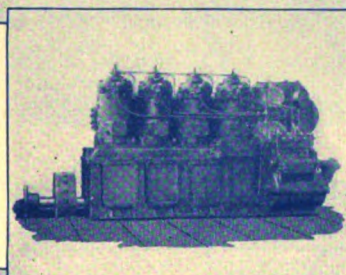
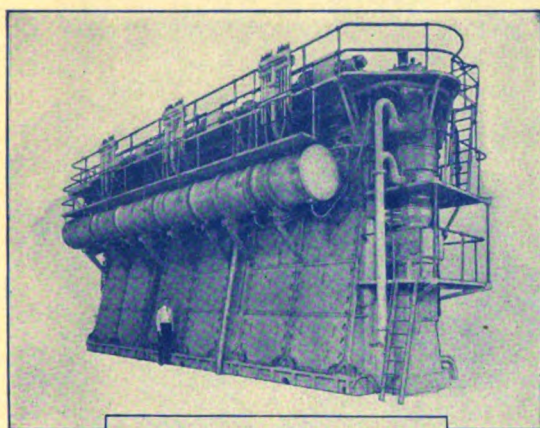


### Type of Engine

This engine is of the vertical, 2-stroke cycle, single acting type.

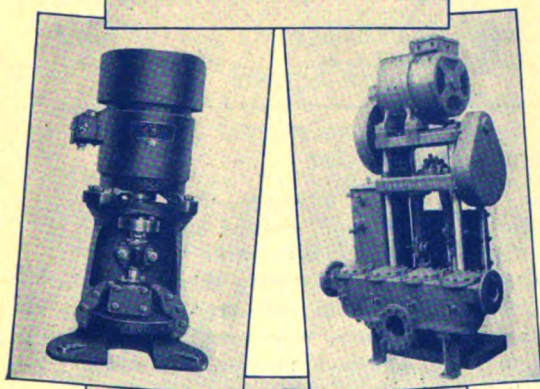
The Bethlehem-Trout type is manufactured at the Moore plant. It is a 2-cycle, airless injection, port scavenging type. It gives the Bethlehem company a proved design of small and medium sized oil engine.

# Complete, to the smallest detail—



Bethlehem  
Oil Engine  
(Large Unit  
Type)

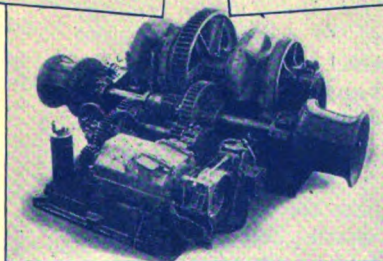
Bethlehem  
(Trout)  
Heavy-Oil  
Engine



Bethlehem Electric-driven  
Windlass

Bethlehem-Drysdale  
Upright Pump

Bethlehem-Weir  
Power Pump



**B**ETHLEHEM takes over steam vessels in which oil engine drive is to be installed and carries out the entire work of conversion, complete to the smallest detail.

This includes furnishing all the equipment.

As a result, when Bethlehem completes a conversion and the motorship is turned over to the owner, he is secure in these two vital points

—All the mechanical units in his motorship are of Bethlehem manufacture; all embody the same standards and are designed to work together as a complete unit.

—The entire responsibility for the satisfactory installation and operation of the motorship is centered in one thoroughly competent organization.

BETHLEHEM SHIPBUILDING CORPORATION, LTD.  
BETHLEHEM, PA.

General Sales Offices: 25 Broadway, New York City  
Sales Offices in Boston, Philadelphia, Wilmington, Baltimore and San Francisco

## A Bethlehem Unit for Every Motorship Requirement

### Main Engine

The Bethlehem Oil Engine (Large Unit Type) is of the two-cycle type, is built in units of four, six and eight cylinders, and in sizes from 1500 to 4200 B. H. P. Service at sea has amply demonstrated its dependability and high fuel economy. It is very compact and can usually be installed with few alterations in the vessel.

### Main Generator Drive

The Bethlehem (Trout) Heavy-Oil Engine is specially adapted for driving generators or other machinery in motorship installations. It is a two-cycle, Diesel-type engine, with port scavenging and airless fuel injection, and is built in units of from 50 to 480 B. H. P.

### Engine Room Auxiliaries

Bethlehem-Weir and Bethlehem-Drysdale Electric-driven Auxiliaries for Motorships embody the correct design and rugged construction essential to marine machinery. They can be depended upon for continuous satisfactory service. These auxiliaries include pumps for circulating water, lubricating oil, and fuel oil transfer; ballast, bilge, fire, sanitary and general service pumps; air compressors.

### Deck Auxiliaries

Bethlehem Electric-driven Deck Machinery for Motorships covers a complete range of types and sizes and includes windlasses, cargo winches, mooring winches, warping winches, steering gears, and capstans.

# BETHLEHEM

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# Installs Powerful Engine in Big Tug

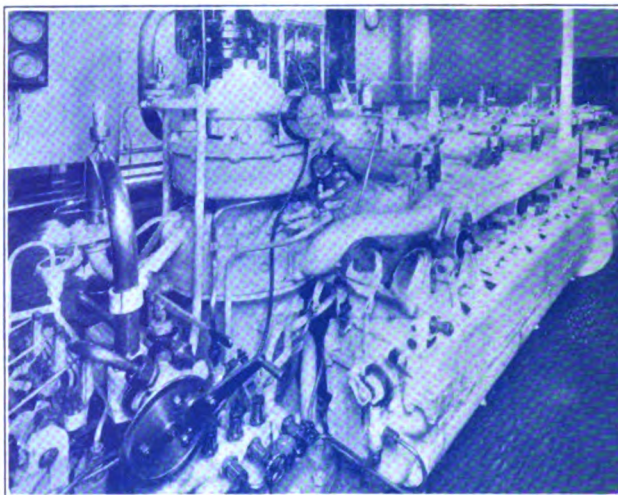
## 4-CYCLE SINGLE ACTING

### Record of Builder

The New London Ship & Engine Co., Groton, Conn., is an engine builder of long experience. It has built submarine type diesel engines and its organization benefits from affiliation with a larger company which has subsidiary shipyards, engine plants and ship operating units.

### Type of Engine

The engine illustrated is in the engine room of the tug Jumbo, one of the most powerful tugs in New York harbor. Since installation, the engine has functioned steadily and economically. It is of the 6-cylinder, 4-cycle, air injection, direct reversible type developing 600 brake horsepower. The company has been for many years a licensee of the M. A. N., German design, diesel engine.



ENGINE ROOM OF TUG JUMBO

## Equips 47 Ships

## 4-CYCLE SINGLE or DOUBLE ACTING

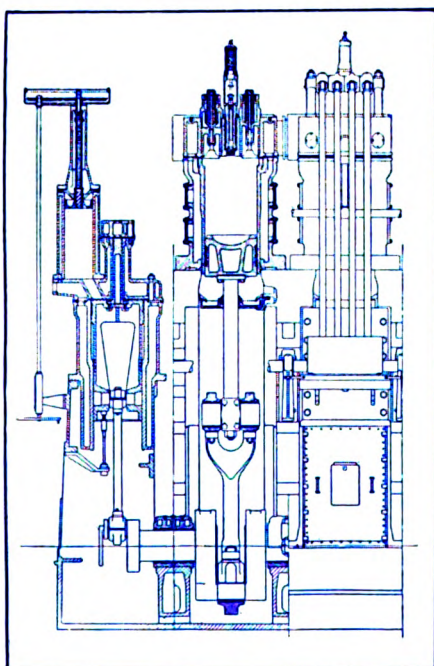
### Record of Builder

The McIntosh & Seymour Corp., Auburn, N. Y., has built engines since 1885. In 1913, it arranged with the Aktiebolaget Diesels Motorer, Stockholm, Sweden, to build that type of engine in this country, with modifications to meet American practice. Up until this time, the Auburn company has equipped 47 vessels with diesel direct or diesel electric drive, all of the ships being of 1000 deadweight tons and larger.

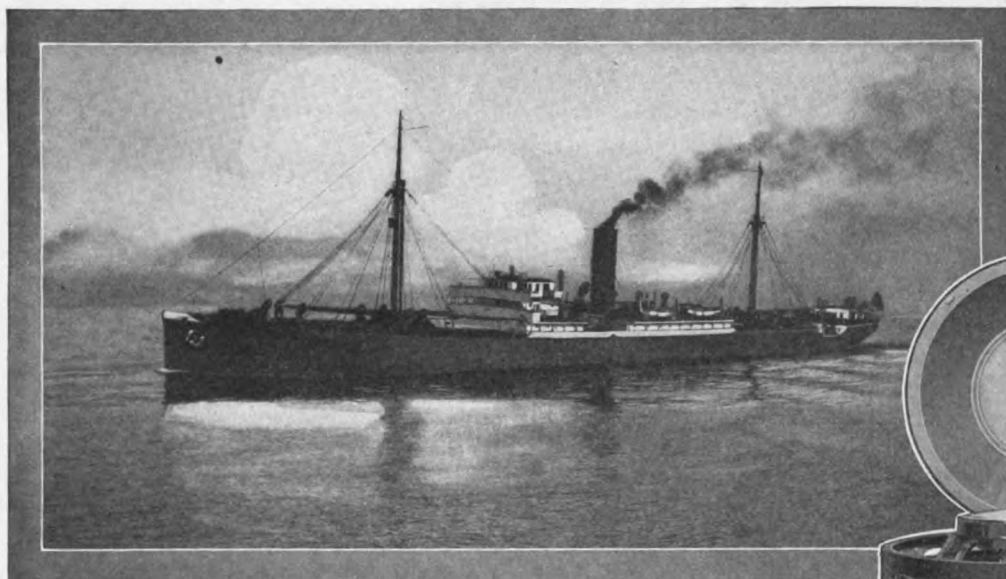
### Type of Engine

These engines are 4-cycle type, either single or double acting. Fuel consumption is put at 0.40 to 0.46 pounds per brake horsepower hour according to the size. The company has outfitted a wide variety of ships, including tankers, dredges, freighters and ferries.

CROSSHEAD TYPE ENGINE



## A SEA CAPTAIN'S REPORT



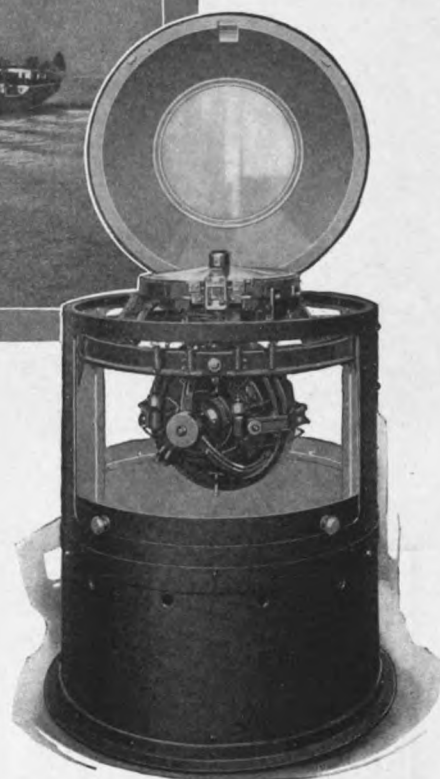
### The Skipper of the above World Cruising Ship reports on the Sperry Gyro-Compass

"During one voyage to Honolulu and return from Baltimore and two voyages around the World, steaming a distance of 66,117 miles, crossing the Equator four times, the Gyro-Compass gave perfect satisfaction.

"On the present voyage from Philadelphia to Boston, through the Panama Canal to Los Angeles, a distance of 5,453 miles, at no time during the voyage was there one minute error. Always true—no variation—no deviation to apply, ever true, day or night—sunshine or rain—snow or fog."

Such testimonials from the service proves not only the ruggedness in design and accuracy in operation of the Sperry Gyro-Compass, but its value as an instrument of navigation.

Navigating true by the Gyro-Compass, increases efficiency, raises the safety factor, and results in general economy in ship operation.



*Sperry Master Gyro-Compass*

## THE SPERRY GYROSCOPE COMPANY

LONDON  
15 Victoria Street, S. W. 1

NEW YORK  
Manhattan Bridge Plaza  
Brooklyn

TOKYO  
Mitsui Building



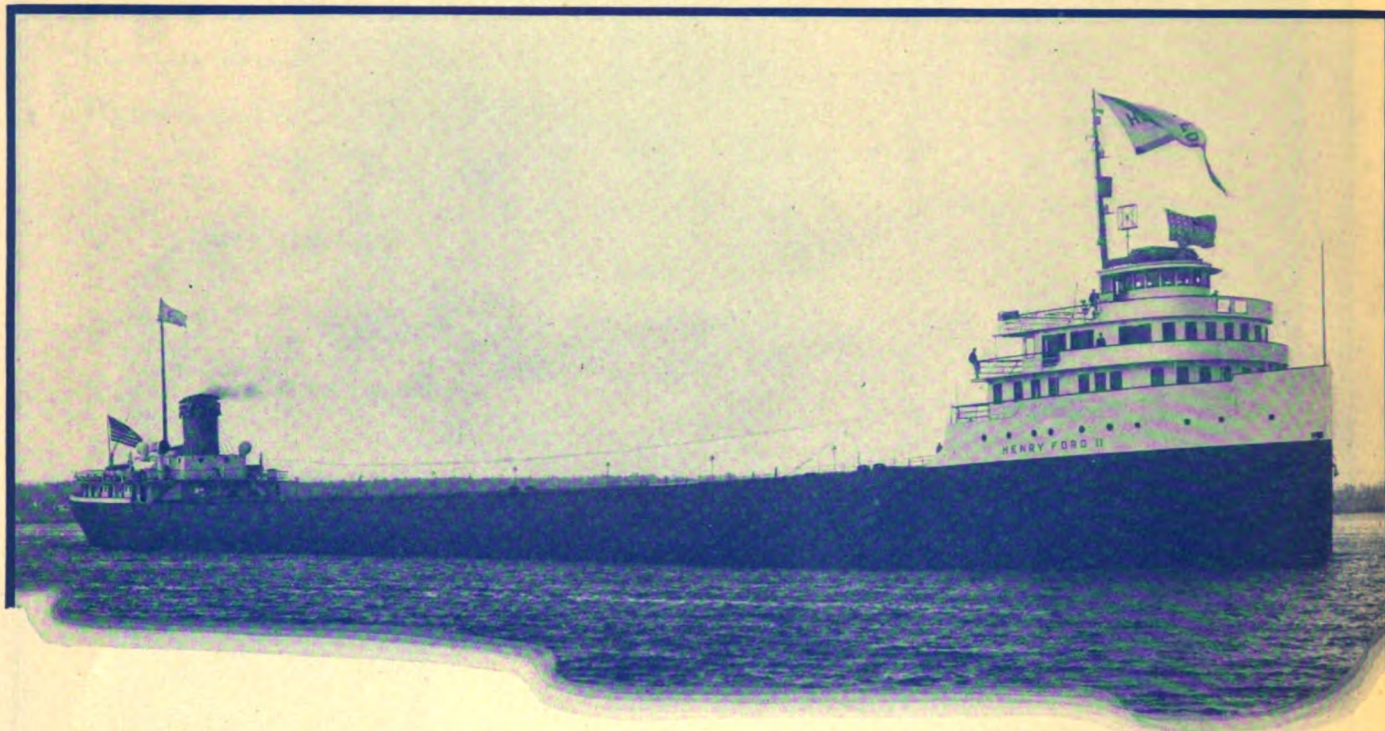
# SPERRY

FOR BETTER NAVIGATION

*Please mention MARINE REVIEW when writing to Advertisers*

# Motorship

Built at Lorain Plant of



## "HENRY FORD II"

Length O. A.	612 Feet
Length B/P	590 "
Beam Moulded	62 "
Depth Moulded	32 "

Sun-Doxford Oil Engine.  
Opposed Piston Type.

All Auxiliaries Electric  
Drive.

Since her delivery to the Ford Motor Company, the "HENRY FORD II" has been carrying coal and iron ore between Detroit and Lake Superior ports without interruption. We point with pride to this achievement as it again demonstrates the capabilities of our engineers and the completeness of our facilities to undertake new problems and to carry them to a successful conclusion.

# The American Corpn

General Office: Foot of W. 54th St., Cleveland, Ohio  
Construction Plants at Lorain, Ohio—Cleveland, Ohio—Detroit, Mich.

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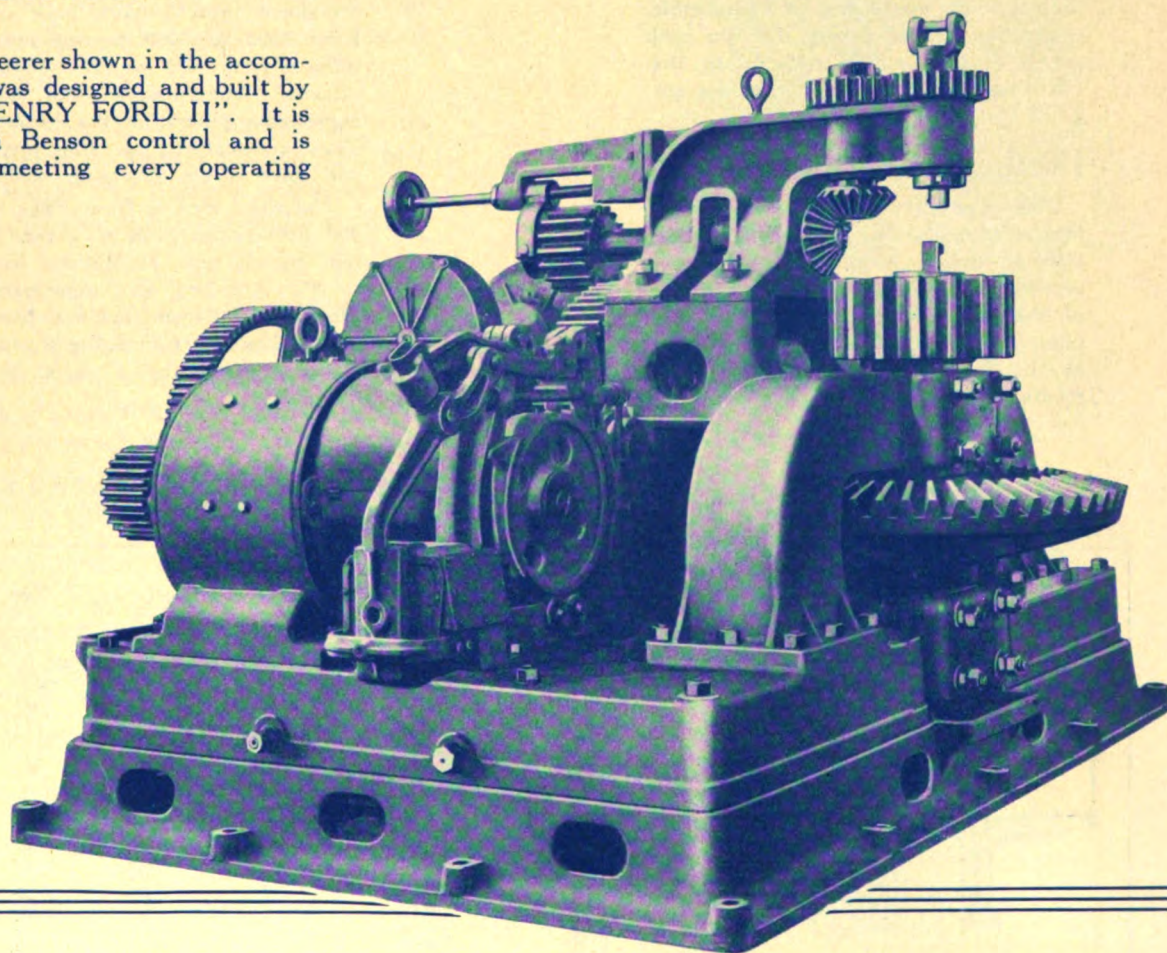
# "Henry Ford II"

The American Ship Building Co. 1924

The A. S. B. Co.  
Electric  
Steerer



The electric steerer shown in the accompanying cut was designed and built by us for the "HENRY FORD II". It is equipped with Benson control and is satisfactorily meeting every operating requirement.



## Ship Building pany

Repair Plants at:

CLEVELAND, O.

CHICAGO, ILL.

LORAIN, O.

MILWAUKEE, WIS.

DETROIT, MICH.

SUPERIOR, WIS.

BUFFALO, N. Y.

Please mention MARINE REVIEW when writing to Advertisers

## Builds Three Distinctive Engine Types

**2 or 4—CYCLE**  
SINGLE or  
DOUBLE ACTING

### Record of Builder

The Hooven, Owens, Rentschler Co., Hamilton, builder of the Hamilton-M. A. N. engine, has had a half century of engine manufacturing experience. It established a remarkable production record during the war and at all times has held position in the front rank for performance of its engines.

### Distinctive Features

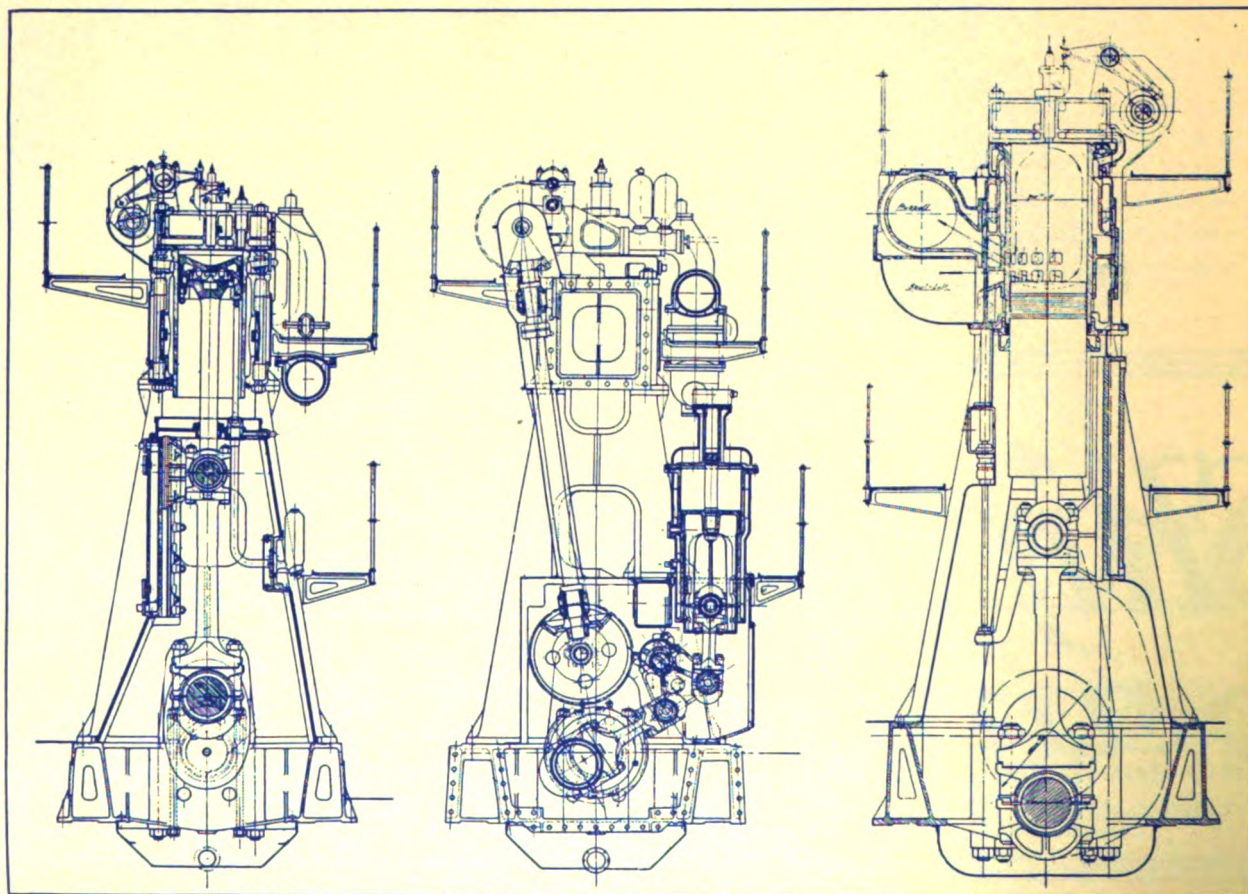
This year the company secured the license to build the famous M. A. N., German design, engine. This gave it access to the engineering experience of the original diesel engine building plant and one which has always been in the foreground in diesel developments. The Hamilton company is

building three distinctive types. For small engines, from 20 to 400 horsepower, it builds a 4-cycle, single acting, solid injection type, with revolutions from 500 to 250. These engines are adapted for direct connection to generator, as auxiliary engines, or with direct reversing gear for ship propulsion. From 500 to 900 horsepower, the engines have air injection.

The second type is a slow running, crosshead type, 2-cycle, built in sizes from 1000 to 3000 horsepower, revolutions from 125 to 90. They have attached compressors and attached scavenging pumps in the larger sizes. They are adapted for ship propulsion and have direct reversing mechanism.

The third size is from 1500 to 15,000 horsepower, and is a double acting, 2-cycle type, revolutions from 140 to 85. Attached air compressors are fitted. The 2-cycle engines have port scavenging, the scavenging through the cylinder being by a new patented method.

CROSS SECTION THROUGH CYLINDER AND COMPRESSOR OF 4-CYCLE, AND AT RIGHT, SECTION OF 2-CYCLE, SINGLE ACTING ENGINES



# And when we determined to build Diesels

We investigated every Diesel. For years, and at a great cost, we went into the subject thoroughly.

Out of it all there came to us this one outstanding conviction: The best Diesel in the world is made at Augsburg, Bavaria, by M. A. N. who made the first Diesel, the largest Diesel and a great aggregate of Diesel horse-power.

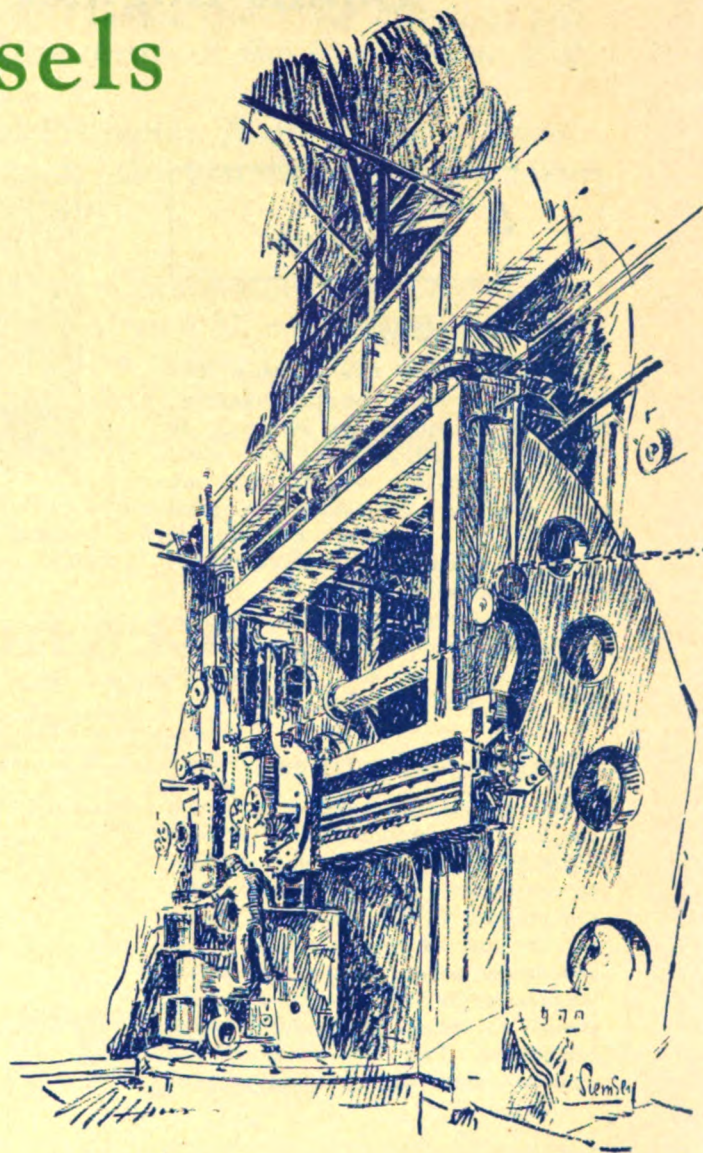
We secured the M. A. N. license and with it all the wealth of Diesel knowledge they had, all drawings and designs and information—everything necessary to build M. A. N. Diesels.

With this license and all it means; with our foundries, engine shops and big, modern tools—with Hamilton engineers and men accustomed to handling the biggest jobs as part of a day's work, we offer to American industry and shipping the Hamilton M. A. N. Diesel with full confidence.

Hamilton engineers and men have built half-a-million horse-power of steam marine engines. In one year we built more steam marine horse-power than any builder or shipyard in the world. This in itself shows we are able to build any type of large engine.

We would be glad to furnish specific detailed information to you if you are interested. Write to our Engineering Department.

THE HOOVEN, OWENS, RENTSCHLER CO.  
ENGINE BUILDERS SINCE 1845  
HAMILTON, OHIO



THIS BORING MILL GIVES SOME IDEA of the large tool equipment in the Hamilton Engine Shops. There is no job too big for our tools and men.

#### Hamilton Products:

CORLISS ENGINES	HAMILTON, M. A. N.
POPPET VALVE	DIESEL ENGINES
ENGINES	SUGAR MILLS
UNIFLOW ENGINES	HEAVY MACHINERY
GAS ENGINES	PLATE GLASS
MARINE ENGINES	MACHINERY
IRON AND SEMI-STEEL CASTINGS	
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# HAMILTON

## M.A.N. Diesel

Please mention MARINE REVIEW when writing to Advertisers

# Builds Engines for 29 Years

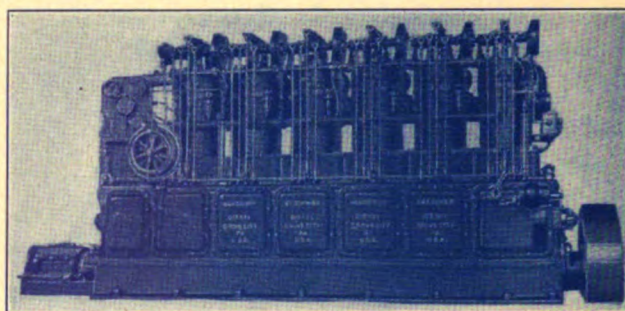
## 4-CYCLE SINGLE ACTING

### Record of Builder

The Bessemer Gas Engine Co., Grove City, Pa., has been building gas and oil engines for 29 years. It has built and shipped more than 32,000 engines, practically all of which are still operating. In taking up diesel engines, the company arranged to build the Atlas-Imperial type, a design already tested in service. In this way, the strength of its own organization was reinforced by the extensive experience of the Atlas-Imperial Engine Co., Oakland, Cal.

### Distinctive Features

This engine is designed to obtain simplicity and economy. Use of solid injection eliminates the high pressure air compressor. Valves are alloy steel. Compression in the combustion chamber at time of fuel injection is 350 pounds per square inch, giving an air temperature of 850 degrees Fahr., high enough to insure rapid and thorough combustion. Two lubricating oil systems are used, the oil being changed



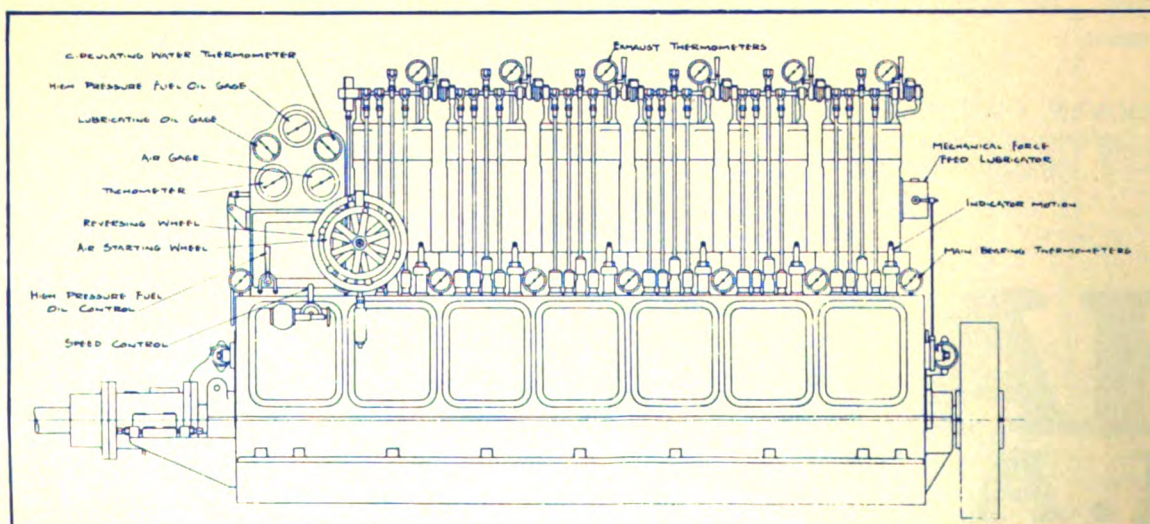
DIRECT-REVERSIBLE, MARINE TYPE DIESEL

about every 1000 hours running and consumption being placed at 2000 horsepower hours per gallon. Pressure for fuel oil injection is about 3500 to 4000 pounds, giving thorough atomization of the intruding oil. Engines up to 360 horsepower are equipped with clutch and reverse gear. Any 6-cylinder engine of 170 horsepower or larger is built directly reversible, if desired. Both systems can be fitted on any engine up to 360 horsepower. Sizes up to 1000 horsepower are built.

### Type of Engine

This is of the 4-cycle solid injection type.

6-CYLINDER MARINE ENGINE OF BESSEMER TYPE, DIRECT REVERSIBLE



## PROTECT THOSE DIESEL ENGINES!

**M**ILLIONS of dollars will be spent by the Board and by ship-owners to give our Merchant Marine the Most Efficient and Most Modern Machinery, under the terms of the Conversion Bill.

The valuable Diesel Engines and Propeller Shafts of these vessels should be protected against damage by the installation of the Most Efficient and Most Modern Governor.

Simultaneous with the passage of the Conversion Bill, Chas. Cory & Son, Inc., announced the new Ramsay Diesel Engine Anticipating Governor—Successfully used on many of the most recent European Motorships where complete protection is provided against racing and shaft breakage under all sea conditions.

Oil-Engine Builders are invited to communicate with us at once in order to incorporate Ramsay Anticipating Governors in the design of their engines for the Conversion Program.

### CHAS. CORY & SON INC.

183 Varick Street, New York City

*The World's Largest Manufacturer of Marine Signaling, Communicating and Lighting Equipment.  
Exclusive Marine Distributors and Installation  
Engineers of Foamite Fire Extinguishing Systems*

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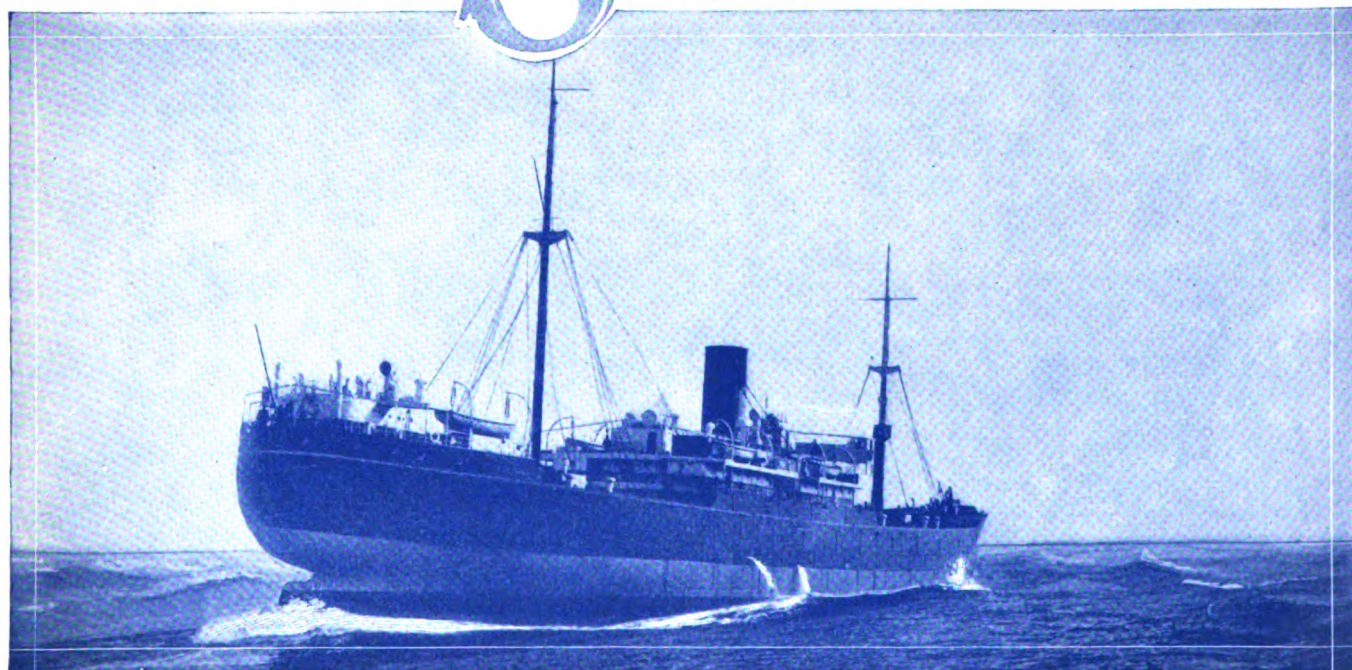
NEW ORLEANS: 826 Baronne Street

SAN FRANCISCO: 11 Mission Street

SEATTLE: 515 Hoge Building

BOSTON: 110 High Street

**Cory Service**



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## Develops Own Design of Engine

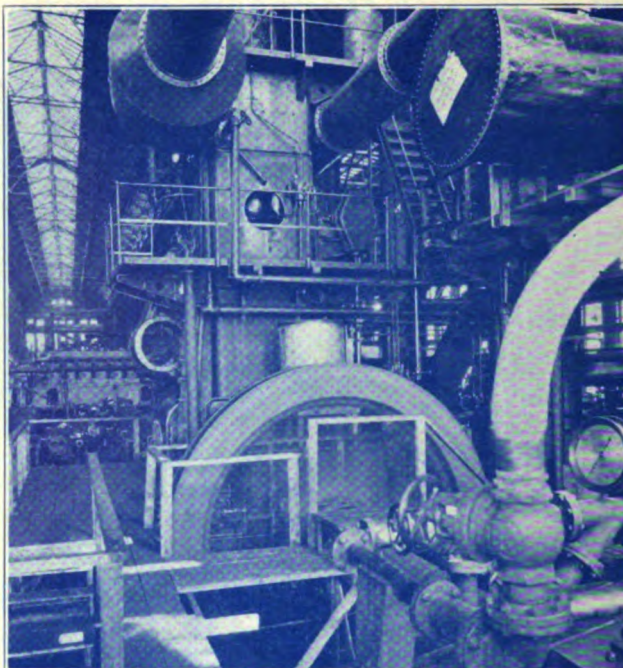
### 2-CYCLE DOUBLE ACTING

#### Record of Builder

The Worthington Pump & Machinery Corp., New York, has long held a front position among American manufacturing companies. It has had 24 years of internal combustion engine building experience, and a few months ago announced its development of a purely American design of double acting, 2-cycle diesel engine. It has built diesel engines since 1912, about 100,000 horsepower being in service.

#### Distinctive Features

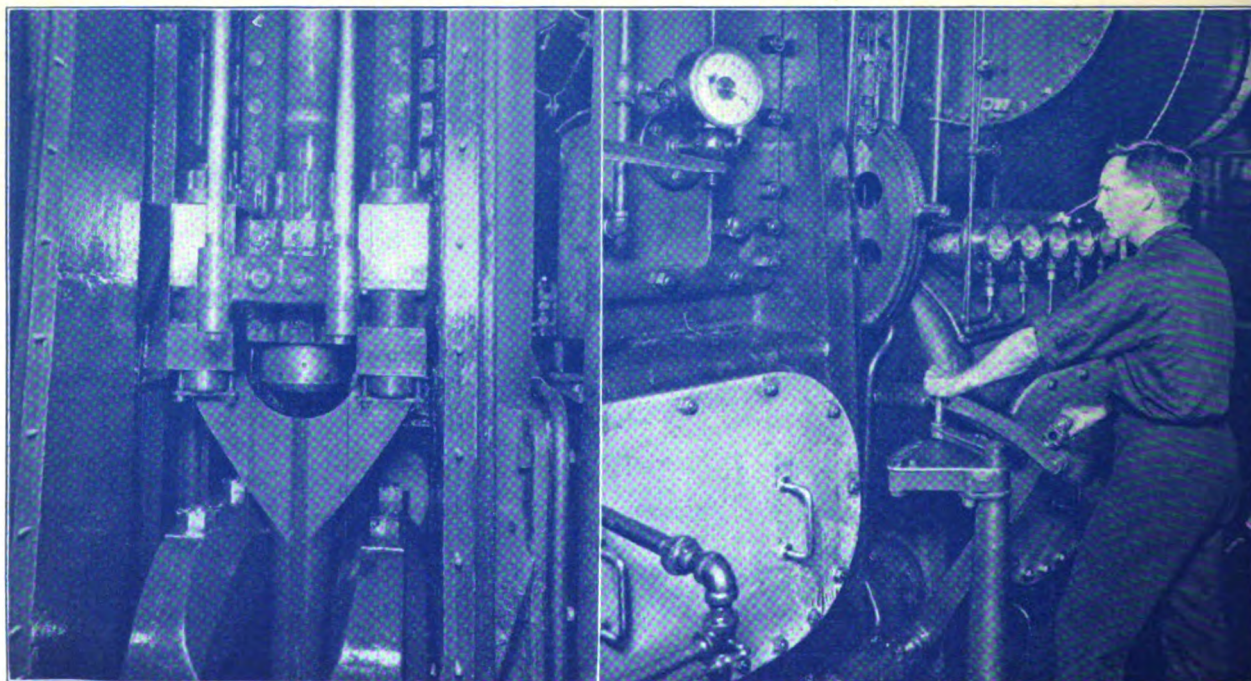
Attention is given to heat stresses so that full advantage can be taken of the lessened weight and better balance of working parts obtainable in a double acting engine. The cylinder of the engine is like two single acting cylinders, opposed end for end. The scavenging and exhaust ports, cooling water circulation and expansion provisions are virtually independent. Three fuel spray valves are provided, one on top of the upper end and two in the bottom head. One of the main points of the design is the method of working out the design of these valves so that uniform distribu-



REAR VIEW OF WORTHINGTON ENGINE

tion of the charge is obtained around the piston rod. The reversing mechanism is of interest. Each of the three valves has its own cam, all three geared to the same shaft. Shifting the cams simultaneously through 34 degrees on the shaft, reverses the running direction. A single lever controls the operation.

PISTON ROD, CROSSHEAD, CONNECTING ROD AND CRANK WITH OPERATING PLATFORM AT RIGHT



# The Significance of the

**WORTHINGTON  
DOUBLE-ACTING TWO-CYCLE  
OIL ENGINE  
(Diesel Type)**

**S E E**

**N E X T**

**P A G E**

### STEAM PLANT

2900 hp. — 80 r.p.m.

LENGTH of  
machinery space . . . 63 FEET

WEIGHT of machinery  
excluding piping . . . 510 TONS

B.t.u. per b.hp. per hr. . . . 21,000

### DIESEL ENGINE PLANT

4-CYCLE SINGLE-ACTING  
2900 hp. — 95 r.p.m.

LENGTH of  
machinery space . . . 66 FEET

WEIGHT of machinery  
excluding piping . . . 710 TONS

B.t.u. per b.hp. per hr. . . . 7,500

### WORTHINGTON

#### OIL ENGINE PLANT

#### DOUBLE-ACTING TWO-CYCLE OIL ENGINE (DIESEL TYPE)

2900 hp. — 95 r.p.m.

LENGTH of  
machinery space . . . . . 42 FEET

WEIGHT of machinery  
excluding piping . . . . . 400 TONS

B.t.u. per b.hp. per hr. . . . . 7,500

*Combining the BEST of each*

## WORTHINGTON

### DOUBLE-ACTING TWO-CYCLE OIL ENGINE

(Diesel Type)

## WORTHINGTON



WORTHINGTON PUMP AND MACHINERY  
CORPORATION

115 BROADWAY, NEW YORK, U. S. A.

Send me your bulletin on the Worthington  
Double-acting Two-cycle Oil Engine Diesel type.

Name.....Company.....

Title.....Address.....

**THE CAUSE****ECLIPSE  
TWO-SEAT  
PISTON RINGS**

*Patented in the United States, May 1, 1917  
Other patents pending in United States and Foreign  
Countries.*

**THE EFFECT**

"When drawing pistons for examination it was often found that one or two top rings were stuck. Experiments were carried out on a couple of pistons using a two-piece "leak-proof" ring and results were so satisfactory that this type of ring has been since installed on all pistons and the sticking of rings, irrespective of fuel used, is of very rare occurrence. During all these tests no attempt was made to secure an oil free from sulphur, moisture, or sediment, and the oil was not centrifuged."

*Extract from article entitled "Boiler-Oil or Diesel Oil Fuels for Motorships" which appeared in Conversion Section of October Issue of "MOTORSHIP".*

**THE REASON**

ECLIPSE TWO-SEAT PISTON RINGS DO NOT STICK IN THE GROOVE BECAUSE THEY ARE FITTED TO THE RING GROOVES WITH A SIDE CLEARANCE OF ABOUT .015". SUCH A CONDITION WOULD INSURE STICKING OF THE CONVENTIONAL RING IN THE GROOVE, FOR THE HIGH VELOCITY OF THE PRODUCTS OF COMBUSTION THROUGH THE GROOVE, BACK OF THE RING, WOULD CAUSE AN IMPACKMENT OF THE SOLID PARTICLES, FIRST IN THE BACK CORNERS OF THE GROOVE, THEN THE ENTIRE SPACE IN BACK OF THE RING AND THE SPACES BETWEEN THE SIDES OF THE RING AND OF THE GROOVE.

WITH THE ECLIPSE TWO-SEAT PISTON RING, HOWEVER, NO LEAKAGE OCCURS EITHER ACROSS THE FACE OF THE RING OR THROUGH THE GROOVE. IT IS THEREFORE OBVIOUS THAT AS COMPRESSION OCCURS IN THE COMBUSTION CHAMBER, COMPARATIVELY CLEAN AIR, AFTER SCAVENGING, MUST BE COMPRESSED IN THE ANNULAR SPACE IN BACK OF THE RING. SINCE THERE IS NO EGRESS EXCEPT THROUGH THE SPACE BETWEEN THE TOP SIDE OF THE RING AND THE UPPER SIDE OF THE GROOVE, IT IS EVIDENT THAT AS EXPANSION OCCURS IN THE COMBUSTION CHAMBER, THE COMPRESSED AIR MUST RUSH OUT THROUGH THIS SPACE, UP BETWEEN THE PISTON AND CYLINDER WALLS, INTO THE COMBUSTION CHAMBER AND ULTIMATELY OUT THROUGH THE EXHAUST. IN OTHER WORDS, THIS TROUBLESOME SPACE IN BACK OF THE RING IS SELF SCAVENGING. OPERATORS REPORT THAT THIS SAME UPBUSH OF AIR KEEPS THE SIDE WALL OF THE PISTON ABOVE THE FIRING RING ENTIRELY FREE FROM CARBON, PREVENTING SCRATCHING OF CYLINDER WALLS FROM THIS CAUSE. THE UNUSUALLY LARGE SIDE CLEARANCE OF ABOUT .015" IS TO ALLOW QUICK RELEASE OF PRESSURE BEHIND THE RING.

TO SUCH AS ARE INTERESTED, WE WILL BE GLAD TO ANSWER SUCH QUESTIONS AS WHY FEWER ECLIPSE RINGS ARE REQUIRED PER PISTON, WHY ONE RING HAS HELD AS HIGH AS 1400 LBS. PER SQ. IN., WHY THEY DO NOT BREAK EVEN WITH OVER .015" SIDE CLEARANCE, WHY RING FRICTION IS REDUCED FROM 40 TO 75%, ETC., ETC.

**SOLE DISTRIBUTOR****J. W. S. MOSS**

**644 RIVERSIDE DRIVE  
NEW YORK, N. Y.**

**CABLE & RADIO ADDRESS  
BELLMOSS, NEW YORK**

**2310-12 N. SECOND STREET  
PHILADELPHIA, PA.**

**IN GERMANY AND LATVIA,  
SIESS V. LOË & CO.  
SANDTORQUAI, 23  
HAMBURG, GERMANY  
GILDENPLATZ, 4  
RIGA, LATVIA**

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ADDRESSED TO OUR  
PHILADELPHIA OFFICE**

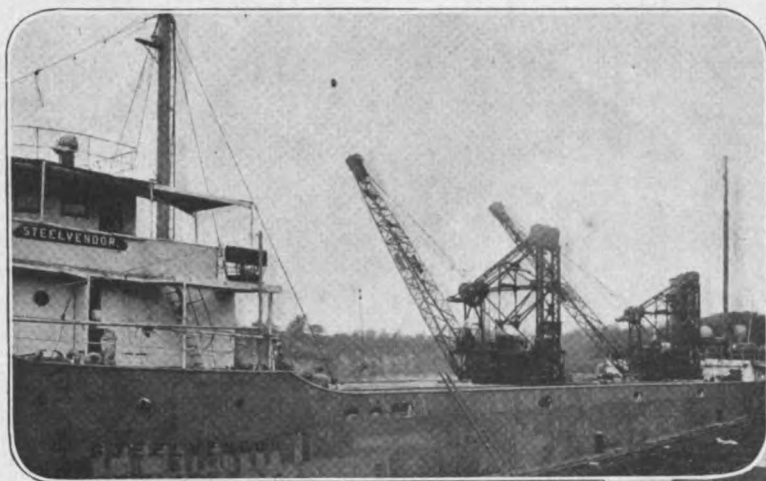
**MANUFACTURED BY  
HOPE MACHINE CO.**

**OUR SPECIAL REPRESENTATIVE  
MR. WILLIAM MANEALOFF  
IS NOW IN EUROPE TO GRANT  
SALES RIGHTS. HIS ADDRESS  
IS 21 MINCING LANE  
LONDON, E. C. ENGLAND**

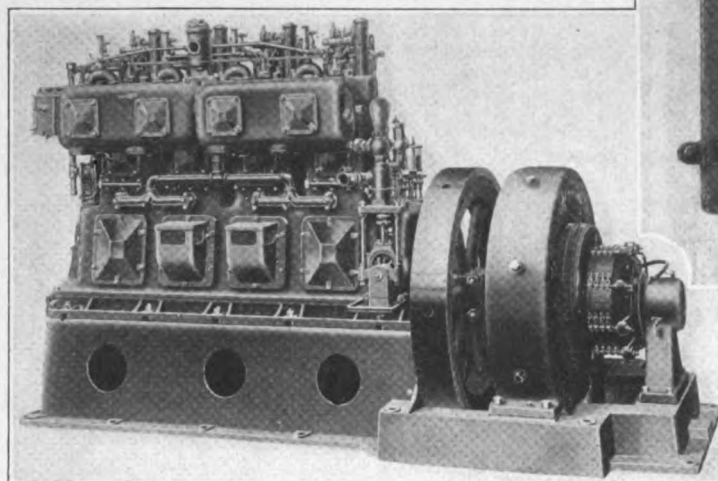
**ECLIPSE**  
TWO-SEAT

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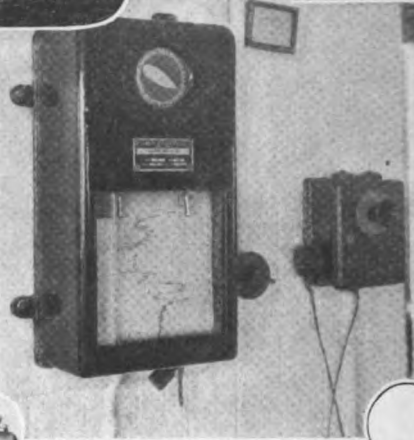
# Many Uses Found for Diesel Electric Equipment



Cargo cranes on lake-ocean motorship driven by Diehl type motors. Below, diesel tug Hustler driven by 320 horsepower Ingersoll-Rand type, direct injection, marine oil engine

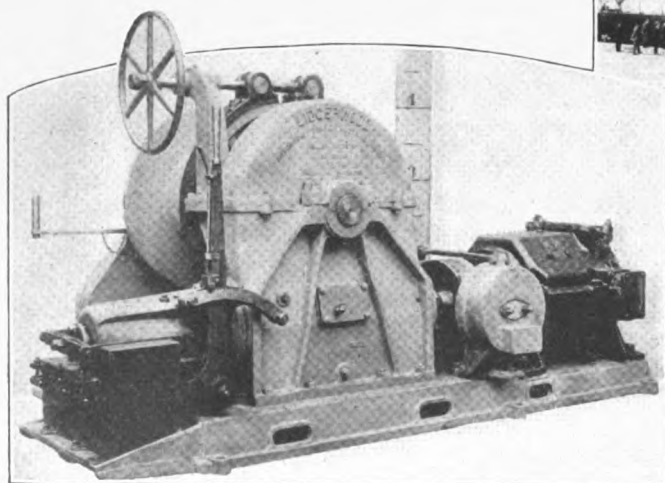
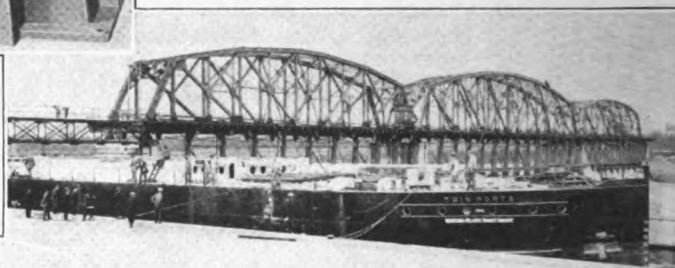


50 horsepower engine direct-connected to 30 kilowatt generator, Engberg type

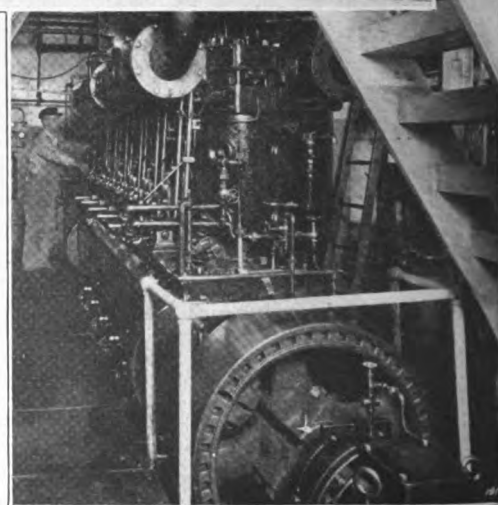


Sperry type course recorder

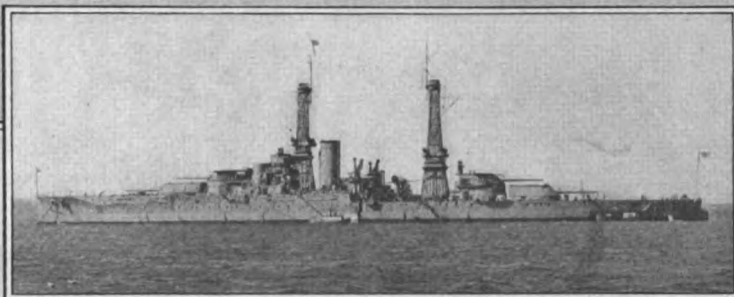
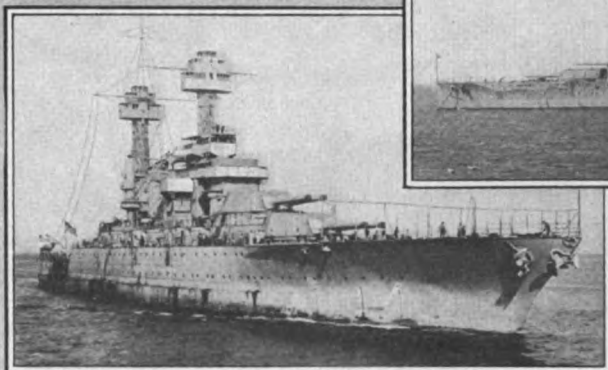
Diesel-electric lake-canal freighter Twin Ports driven by Lombard engine and General Electric propulsion machinery



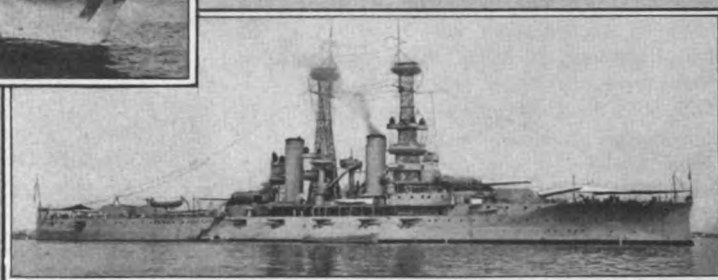
Automatic tension mooring winch, Lidgerwood type, and at right, 220-horsepower Ingersoll-Rand engine driving Hudson river ferry



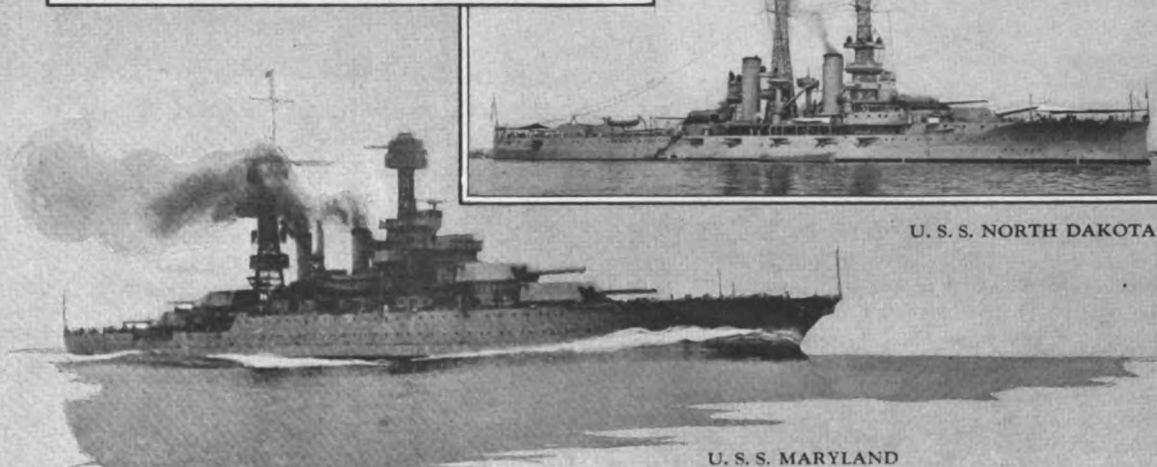
U. S. S. WEST VIRGINIA



U. S. S. NEVADA



U. S. S. NORTH DAKOTA



U. S. S. MARYLAND

## Anaconda Condenser Tubes on the Navy's Capital Ships

Even during the demand of war-time production, condenser tubes manufactured by The American Brass Company exceeded the United States Navy specifications and easily passed all rigid Government tests.

### THE AMERICAN BRASS COMPANY

GENERAL OFFICES: WATERBURY, CONNECTICUT

New York, Chicago  
Boston, Philadelphia, Providence  
Pittsburgh, Cleveland, Detroit  
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Mills and Factories:  
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# Fuel Saved by Scavenging Port System

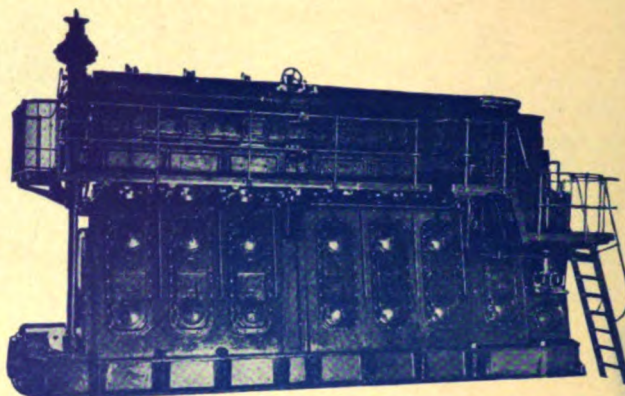
## 2—CYCLE SINGLE ACTING

### Record of Builder

The Busch-Sulzer Bros.-Diesel Engine Co., St. Louis, was the original American manufacturer of diesel engines, beginning in 1898, and being the only American builder until 1911. It builds both 2 and 4-cycle types, the latter only for stationary work. It is affiliated with the Swiss firm of Sulzer Freres, one of the original diesel engine builders of the world.

### Distinctive Features

In this design, especial emphasis is placed on the patented scavenging and charging system. Scavenging is done through ports, two tiers being used instead of the customary one tier. The method is designed to avoid any possibility of a blow-back into the scavenging receiver; to fill the cylinder at scaveng-



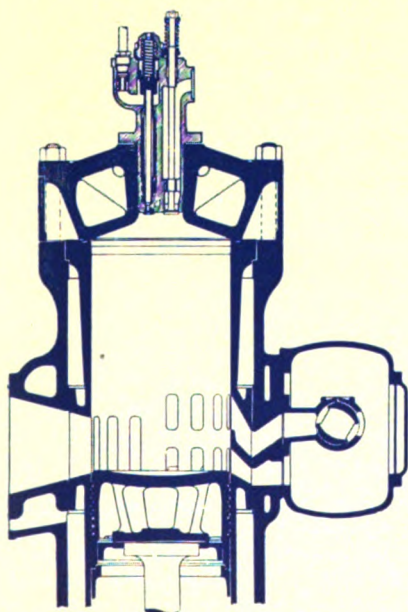
2 CYCLE MARINE DIESELS, SIZES UP TO 5000 S. H. P.  
PER ENGINE

ing pressure after the upward moving piston covers the exhaust ports and to obtain a thorough purging of the burnt gases. The illustration shows this design.

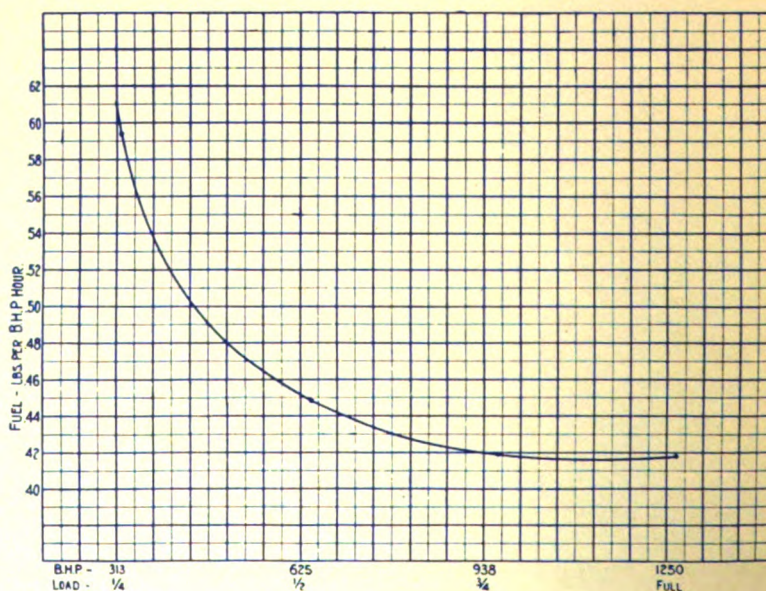
### Type of Engine

These engines are vertical, 4 or 6 cylinder, single acting, crosshead type.

CYLINDER SHOWING 2-CYCLE SCAVENGING SYSTEM



CURVE SHOWING FUEL CONSUMPTION—1250 B. H. P.—2-CYCLE MARINE DIESEL



# BUSCH-SULZER Diesel Engines

26 YEARS  
of  
American Diesel Experience

**F**OR MORE than a quarter century we have been building Diesel engines. In our modern units the design and materials used are based on results from engines in long service.

Added to our own experience is that of our partners, Sulzer Brothers, whose engines are found in many of the largest modern motorships, such as:

9,000 ton cargo carrier	"Handicap"	2700 BHP, 100 RPM, twin screw
6,500 ton tanker	"Conde de Churruca"	2500 BHP, 100 RPM, twin screw
8,500 ton passenger and cargo	"Dalgoma"	3200 BHP, 85 RPM, twin screw
10,000 ton tanker	"Scottish Borderer"	2500 BHP, 100 RPM, twin screw
7,700 ton tanker	"Capena"	2500 BHP, 100 RPM, twin screw
14,000 ton tanker	"Phoebus"	3400 BHP, 90 RPM, twin screw
11,700 ton passenger and cargo	"Camranh"	3400 BHP, 90 RPM, twin screw
12,000 ton passenger	"Fulda"	5000 BHP, 85 RPM, twin screw
20,000 ton passenger	"Aorangi"	13000 BHP, 130 RPM, quad. screw
5,000 ton cargo carrier	"Beldie"	1250 BHP, 100 RPM, single screw
8,000 ton cargo carrier	"No. 853"	1800 BHP, 90 RPM, single screw
15,000 ton passenger	"Indra-Poera"	7000 BHP, 85 RPM, twin screw
10,040 ton passenger and cargo	"Atago-Marui"	4000 BHP, 100 RPM, twin screw
12,000 ton passenger	"No. 501"	6000 BHP, 100 RPM, twin screw
10,100 ton tanker	"No. 51"	2700 BHP, 100 RPM, twin screw
5,000 ton cargo carrier	"Wieringen"	1160 BHP, 85 RPM, single screw
13,600 ton passenger	"Bintang"	3600 BHP, 90 RPM, single screw
14,000 ton passenger	"P. C. Hooft"	8000 BHP, 100 RPM, twin screw
11,000 ton passenger	"M. N."	4500 BHP, 110 RPM, twin screw
10,300 ton tanker	"No. 54"	2250 BHP, 110 RPM, single screw
9,500 ton cargo carrier	"No. 617"	6400 BHP, 115 RPM, twin screw

We offer engines of the same type as those on above boats.

## Busch - Sulzer Bros.-Diesel Engine Co.

St. Louis, Mo.

Sales Offices: 60 Broadway, New York—Rialto Bldg., San Francisco

Please mention MARINE REVIEW when writing to Advertisers



# Swift, Economical, Dependable

## **Pan American Line**

*Munson Steamship Line, Managing Operators*

To South America from New York  
Express Freight Service (with refrigerator space)  
Fortnightly for Rio de Janeiro, Montevideo and Buenos Aires (Alternate sailings also call at Santos)

## **American Mail Oriental Line**

*Admiral Oriental Line, Managing Operators*

Fastest Time between U. S. A. and the Orient. Sailings Every 12 days from Seattle to Yokohama, Kobe, Shanghai, Hong Kong and Manila. Through bills of lading issued to destination beyond regular ports of call.

## **California Orient Line**

*Pacific Mail S. S. Co., Managing Operators*

Sailings every 14 days from San Francisco to Yokohama, Kobe, Shanghai, Hong Kong and Manila via Honolulu.

## **United States Lines**

Frequent Sailings from New York to Cobh (Queenstown), Plymouth, Southampton, Cherbourg and Bremen.

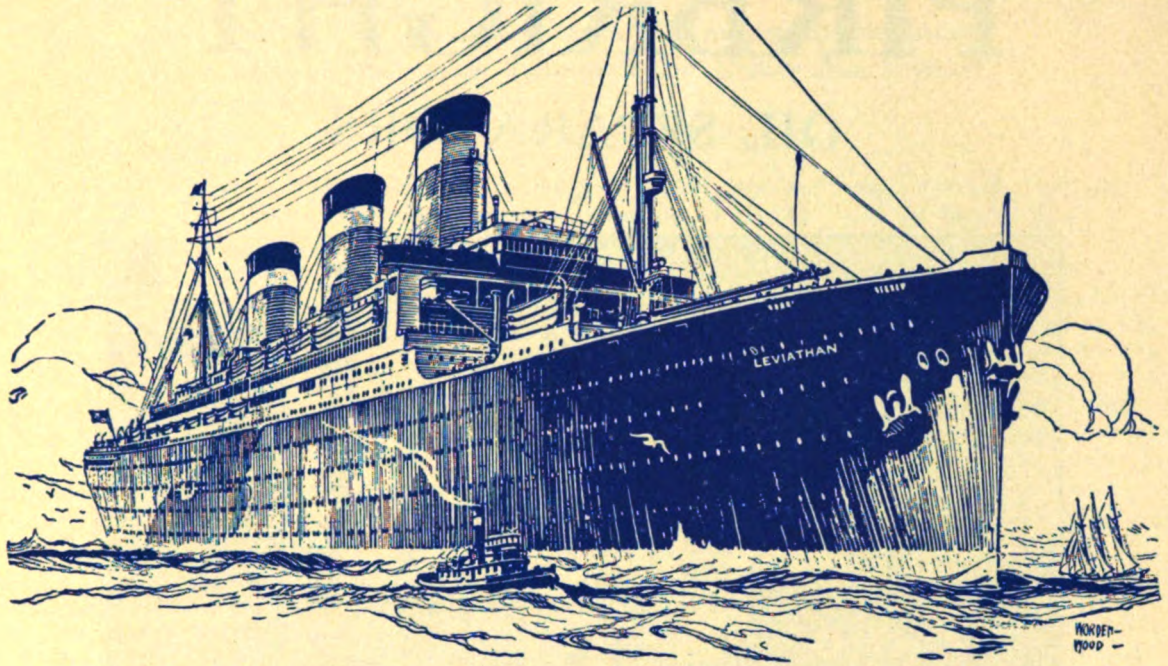
For Sailings of Freight Ships to All Parts of the World

*Write to Traffic Department*

# UNITED STATES SHIPPING BOARD

Washington, D. C.

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## American Ships for Americans

EVERY American should know of the advantages of shipping and traveling on American vessels. U. S. Government owned ships are not surpassed anywhere, for availability, economy and efficient service. They are establishing new records for speed in handling freight and in making prompt and safe delivery.

Under the direction of experienced operators these ships sail from the great ports of the United States to practically every important port in the world.

Every American exporter should investigate this splendid service. We have a man in your territory who will gladly acquaint you with all particulars.

*For Information Address Traffic Department*

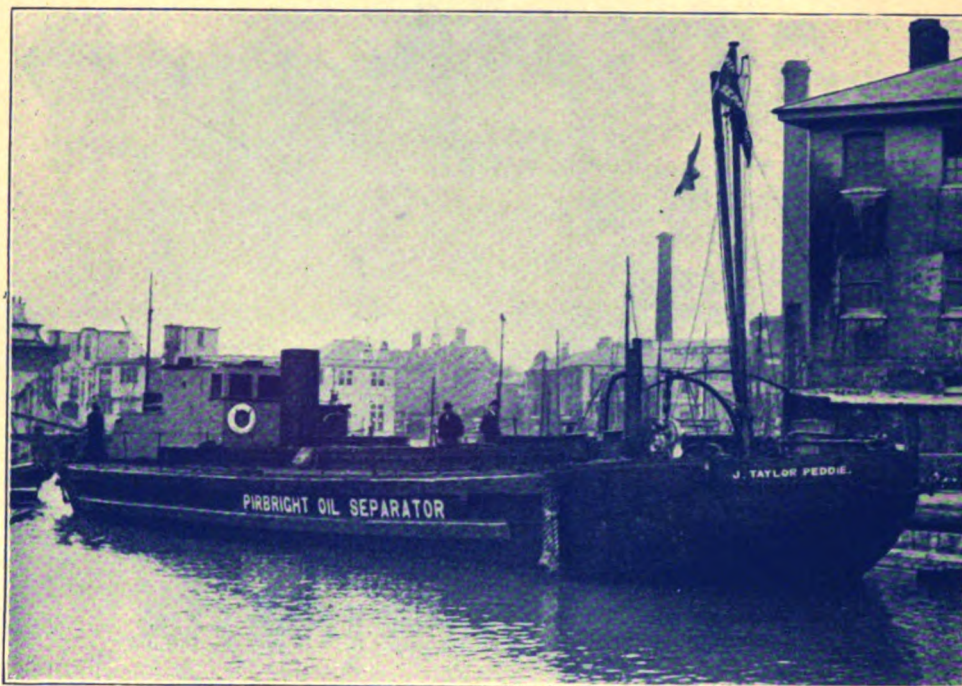
### UNITED STATES SHIPPING BOARD

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# PIRBRIGHT

## OIL SEPARATORS



THE PIRBRIGHT OIL SEPARATING BARGE "J. TAYLOR PEDDIE".  
NOW OPERATING AT SOUTHAMPTON (ENG.)

### THE PIRBRIGHT COMPANY

will shortly have lighters working in the ports of New York and Boston for separating the oil from Bilge and Ballast water of ships.

RATES for their employment to be had on application to London office.

Enquiries for Separators of Industrial and Marine Types and for Barges should be addressed to

### CHEMICAL ANALYSIS

has shown the water discharged to be absolutely free from oil, and the recovered oil to be fit for return to ships' storage tanks.

An office will shortly be opened in New York.

**THE PIRBRIGHT COMPANY, LTD.**  
**Bond Court House, Walbrook, London, E.C.4**

*Please mention MARINE REVIEW when writing to Advertisers*

# Find More Uses for Electricity

**Ships Rely Now on Electrical Equipment for Innumerable Services—Economy and Utility Are Proved**

BY W. H. WILD

**T**HE first electric plant on a ship was installed on the steamship *COLUMBIA*, under the direction of Thomas A. Edison. It was first started in May, 1880, and supplied current for 115 lamps. It was successful, and in 1882 similar installations were made on the *QUEEN OF THE PACIFIC*, and on the steam yacht *NAMOUNA*, owned by the late James Gordon Bennett. It is also reported that during the summer of the same year, electric lighting was installed on Russian steamers plying the river Volga. These installations did much to attract attention to the possibilities of electricity, and in August, 1883, electric lights shone from the *TRENTON* of the United States navy.

In the early installations, the generators were belt-driven, but on account of the deterioration and stretching of the belts caused by salt air and water, this method was soon discarded in favor of direct connected generators.

The recognition of the shortcomings of belt-driven machines on board ship marks the first step in the design of electrical apparatus definitely suited to marine service. From this point on, engineers began to recognize the fact that electrical apparatus intended for use on ships presents a problem distinctly dissimilar to parallel land applications. Occasional failures of electrical apparatus have done much to impress ship owners, ship operators and electrical manufacturers of the important distinctions between land and sea applications.

Without question, a majority of such failures have been caused by lack of knowledge, or at least by a lack of appreciation, of the special conditions presented in the applications of electric power to marine use. However, full advantage has been taken of these experiences, and the resulting information has given a much clearer view of marine power problems. Better methods and better design have resulted.

Through the united efforts of ship-owners, operators and electrical manufacturers—all of whom have a responsibility in solving this problem—the growth of electricity's use on shipboard has been rapid. No greater proof can be found than the present diversity of uses which are made of electric power. With the

increasing tendency to utilize land appliances on ships, knowledge of the differences between land and marine uses has constantly expanded.

Following the electric lamp came the use of motors for driving auxiliaries. Today one finds electric motors driving compressors; oil, boiler feed, circulating, bilge and cargo pumps; and winches and hoists of a dozen different uses. Motors operate passenger elevators and ammunition hoists, raise periscopes or airplanes, load and unload cargo, and even elevate huge 16-inch guns.

However, the use of electricity on shipboard has spread slowly in the past 25 years, as compared to its remarkable progress on land. To a large degree, this slow development has been a result of the justifiable conservatism of shipowners and shipbuilders, and to the fear that ship and dock crews might not readily become accustomed to, and adept in, operation of such machinery.

## Navy Aids in Growth

Electric ship propulsion and the application of the diesel engine have done much to instill confidence in the use of electricity. No doubt the United States navy has been one of the greatest contributors in demonstrating the advantages of electrical apparatus for ships, through the extensive use of this form of power on naval craft, both for propulsion and auxiliary machinery.

Electric ship propulsion was first made prominent in 1908, when W. L. R. Emmet applied this form of power to two fireboats for the city of Chicago. These boats are still operating successfully and reports indicate that no serious troubles have developed during their long service.

As the size and required speed of merchant and war vessels increased, steam machinery became exceedingly large and heavy. A great opportunity existed to build propulsion machinery that would be lighter, more economical and more flexible.

In 1913, Mr. Emmet applied electric propulsion to the United States collier *JUPITER*. The success of this installation prompted the United States government to adopt electric propulsion for all warships of the superdreadnaught class. The latest equipment now being installed has a capacity of about 180,000 horsepower, or more than enough to

supply the light and power needs of a city the size of Boston.

Unquestionably the most revolutionary application of electricity on the sea is in connection with the propulsion equipment. Apparatus of the type installed on the *JUPITER*, generally termed turbine-electric drive, utilizes the steam turbine as a prime mover, and is direct-connected to the generator, usually of the alternating current type. Such equipments are now successfully driving fireboats, cargo boats, ferry boats and various types of naval vessels. Up to the present time, Japan is the only other country which has adopted turbine-electric drive, this being on the fuel ship *KAMOI*; the machinery of which was built and installed in the United States.

An important group, as yet reluctant to join the growing electric fleet, is that of large passenger vessels. The Matson Navigation Co., San Francisco, is now considering turbine-electric propulsion equipment for its large new passenger liner.

By installing electric propulsion machinery, these "floating palaces" will achieve the height of modern service, and it seems reasonable to believe that electrically driven passenger ships will be popular with the traveling public, due to the absence of vibration.

About 1904, the diesel engine was first considered for driving ships and it is interesting to note that the initial attempt to apply this type of engine to this use, was in connection with electrical apparatus, as the reversing feature of the engine had not yet been developed. The desirability of being able to reverse the engine was at once apparent, and this feature was soon successfully worked out and the direct connection of the diesel engine to the propeller shaft followed.

In the early installations of the diesel engine, steam driven auxiliaries were retained, a separate boiler being installed for that purpose. It quickly became apparent that a great saving in fuel could be accomplished by using electric generators driven by internal combustion engines for operating electric auxiliaries in place of the steam auxiliaries. At the present time, steam auxiliaries are rarely used in connection with diesel driven ships. The experience thus obtained has led to greater

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# Expert Analyzes Diesel Bids

IN THIS article, a diesel engine expert analyzes the bids received by the shipping board on its plan for converting 12 or more of its idle steamers to motorships. This business attracted bids from every builder. In view of the different types involved, this wholesale bidding offered a genuine opportunity for profitable study and analysis, not only by interested engine builders but by prospective buyers and operators. For that reason, Marine Review is glad to offer its readers the first complete and practical analysis of what is probably the largest group bidding ever made for a diesel engine contract.

WHILE it would seem that the shipping board should be congratulated for the variety of bids received on diesel engines destined for the first installment of its conversion program, it does not appear that the opinion of some writers as to the attractiveness of the prices submitted, which in some cases appear to lack justification, can be accepted. Manufacturing costs may still be high for this class of work due to the greater skill and refinement required as compared with steam installations, which costs will

undoubtedly show a downward trend with the expansion of the industry and standardization of design as well as reduction in number of types, but it is obvious that some sacrifices must be made at first in order to attract ship-owners. Such sacrifices are evident in some instances as it will appear later and these individual cases deserve praise. It will not be out of order, therefore, to analyze the various engines submitted on the basis of the published data and see what their comparative values are, both technical and as to cost.

It will be necessary to reduce all proposals to a common base of comparison, and for this reason deductions have been made for the shop test charges so that engine selling costs only are compared, and since the majority of the engines submitted have their own auxiliaries attached, such as scavenging pumps and air compressors, only those so specified have been considered.

In the case of the mean effective pressure, the figures shown have been derived directly from the rated brake horsepower, while the figures for mean

Table I  
Complete Diesel Engine Bids Submitted to Shipping Board

Bids as Submitted to Shipping Board										
Fleet Corporation										
No.	Make	1 Type	2 B H P	3 R P M	4 No. Cyl.	5 Bore & Stroke Ins	6 One Engine \$	7 Two Engines \$	8 Three Engines \$	9 Four Engines \$
8	Bethlehem	Own Two	2225	95	6	26 x 48	278,500	529,000	755,000	968,000
X	"	Cycle S. A.	2400	95	6	26 x 48	279,600	531,200	758,300	972,400
9	"		2700	85	6	27 x 60	338,500	645,000	892,800	1,181,400
7	Busch-Sulzer	Sulzer Two Cycle S.A.	3000	90	6	30 x 52	323,700	587,800	837,875	1,111,675
5	Cramp	B & W Four Cycle S. A.	2500	90	8	29 1/8 x 59	320,000	614,000	896,000	1,171,000
4	Falk (Solid Injection) Geared Engines	Own Four Cycle S.A.	2400 3000	75 75	12 12	20 x 28 24 x 28	168,100 231,100	321,100	475,100	627,100
15	Hamilton	MAN Two Cycle D.A.	3050	95	4	27.55 x 43.3		534,500		
o	McIntosh & Seymour	Polar Four	2500	95	6	32 x 60	279,650	550,675	826,200	1,083,725
4	"	Cycle S.A.	2350	95	6	32 x 60	255,586	501,922	753,058	984,994
o	"	"	3450	95	8	32 x 60	363,830	716,625	1,075,020	1,420,315
12	"	D.A.	2700	95	4	32 x 52	248,200	487,680	731,560	957,140
13	New London	Man Two Cycle D.A.	3000	95	4	27.55 x 43.3	210,000	410,000	606,000	808,000
3	New York S.B.Co.	Werkspoor Four Cycle S.A.	2432	90	8	29 x 59	205,000	410,000		
6	Nordberg	Carols Two Cycle S.A.	3000	90	6	29 x 54	283,500	513,500	743,500	990,500
1	Pacific	Werkspoor Four	2150	95	8	28 3/4 x 51 3/16	185,500	360,000	522,500	699,000
2	"	Cycle S.A.	2585	95	8	31 1/2 x 51 3/16	198,500	385,000	553,000	740,000
10	Sun (Solid Injection)	Doxford O.P.	2500	90	4	22.83 x 91.34	195,000	390,000	585,000	780,000
11	"	Two Cycle S.A.	3000	90	4	23.62 x 91.34	225,000	450,000	675,000	900,000
14	Northington	Own Two Cycle D.A.	2900	95	4	28 x 40	223,724	420,714	606,161	780,428

x Separate Turbo-Scavenger.  
& Actual Speed of engines has not been published.  
o Separately driven compressors.

Table II

## General Characteristics of Diesel Engines Offered Shipping Board

Bids as Submitted to Shipping Board												
Fleet Corporation												
No.	Class & Make	1 B H P	2 MEP lbs. Sq. in.	3 ME	4 I H P	5 MIP lbs. Sq. in.	6 R P M	7 No. Cyl.	8 Bore & Stroke ins.	9 Piston Speed ft./min.	10 Total Cylinder Volume cu. ins.	11 Total Cylinder Volume cu. ft.
A Four Cycle Single Acting												
1	Pacific-Werkspoor	2150	67.6	.75	2870	90.0	95	8	28 1/2 x 51 3/16	767	266,808	153.82
2	"	2585	67.6	.75	3445	90.0	95	8	31 1/2 x 51 3/16	767	319,072	184.64
3	N.Y.S.B.Co.	2432	68.6	.75	3245	91.4	90	8	29 x 59	885	311,752	180.41
4	McIntosh & Seymour	2360	67.7	.75	3130	90.2	95	6	32 x 60	950	286,642	166.96
5	Cramp-B & W	2500	69.9	.78	3200	89.4	90	8	29 1/8 x 59	885	314,440	181.96
	Aver.		68.2	.756		90.6				850		
B Two Cycle Single Acting												
6	Nordberg-Carels	3000	61.7	.71	4200	86.5	90	6	29 x 54	810	214,002	123.84
7	Busch-Sulzer	3000	59.9	.70	4285	85.6	90	6	30 x 52	780	220,518	127.56
8	Bethlehem	2225	56.7	.70	3180	81.0	95	6	26 x 48	760	162,898	88.48
9	"	2700	61.0	.70	3860	87.1	95	6	27 x 60	850	206,100	118.27
	Aver.		59.8	.704		85.0				800		
C Two Cycle Opposed Piston												
10	Sun-Doxford	2500	75.6	.85	2940	86.5	90	4	22.82 x 91.34	685	150,616	87.16
11	"	3000	82.6	.85	3520	97.1	90	4	23.62 x 91.34	685	161,012	93.17
	Aver.		78.0	.85		91.8				685		
D Four Cycle Double Acting												
12	McIntosh & Seymour	2700	71.2	.80	3375	89.0	95	4	32 x 52	842	167,264	96.79
E Two Cycle Double Acting												
13	New London-MAN	3000	64.3	.75	4000	85.7	95	4	27.55 x 43.3	685	102,920	59.56
14	Worthington	2900	65.2	.75	3870	86.9	95	4	28 x 40	600	98,512	57.00
15	Hamilton-MAN	3050	65.3	.75	4155	87.0	95	4	27.55 x 43.3	685	102,920	59.56
	Aver.		64.9	.75		86.5				657		
A - These engines seem underrated. Aver. Pist. Sp. could be increased to advantage.												
B - These engines seem overrated. Piston Speed could be reduced.												
C - These engines are in a class by themselves.												
D - This engine slightly overrated, should show 85% better than 4c S.A. when properly rated.												
E - These engines slightly overrated.												

indicated pressure have been computed on the basis of the given indicated horsepower where available, and derived from assumed mechanical efficiencies where the indicated horsepower was not available. These mechanical efficiencies have been taken from past records of engines of the same type and make, and covering several engines of the same class. Where, such efficiencies do not coincide with the manufacturers' views, we shall be glad to make corrections as the case may warrant.

It must be observed that the limitations imposed by the shipping board do not correspond with accepted practice but they can be considered safe and conservative. For instance, the limit of 90 pounds per square inch mean indicated pressure for 4-cycle engine has been exceeded in practice by an appreciable amount. Numerous engines are operating today under higher mean indicated pressure without objectionable results. Some go as high as 100 pounds but let us accept the shipping board limits as a starting point both for 2 and 4-cycle engines. On the other hand the limit of 900 feet per minute piston speed for both 2 and 4-cycle engines is not borne out by experience. Four-cycle engines can go higher than this limit with impunity, while 2-cycle engines should not even approach it, especially the port scavenging and port exhaust types where

lubrication exigencies demand that a lesser number of rubbing alternations over the ports be adhered to; 900 feet per minute can be considered a safe

limit for 4-cycle engines while 750 feet per minute should be considered a better figure for 2-cycle engines.

Based on the above considerations the

Table III  
Comparative Characteristics of Diesel Engines

Comparative Characteristics - Shipping Board Engines									
No.	1 Cu. Ft. BHP min.	2 BHP Cu. Ft. min.	3 Actual Ratio BHP Cu. Ft. min.	4 Standard Ratio BHP Cu. Ft. min.	5 BHP	6 Cu. Ft. BHP min.	7 Cu. in.	8 Actual \$/Cu. in. Ratio	9 Standard \$/Cu. in. Ratio
<b>A</b>									
1	6.79	.147			85.30	12.71	.70		
2	6.78	.147			75.80	11.32	.62		
3	6.67	.150			84.30	12.63	.66		
4	6.75	.148			106.70	16.10	.89		
5	6.55	.163			126.00	19.54	1.02		
Aver.	6.70	.149	100	100	95.80	14.46	.778	80	130
<b>B</b>									
6	3.71	.271			94.60	25.45	1.32		
7	3.63	.261			107.80	28.17	1.47		
8	3.77	.265			125.20	33.20	1.82		
9	3.72	.269			125.80	33.70	1.64		
Aver.	3.75	.266	178	176	115.20	30.13	1.56	100	100
<b>C</b>									
10	3.17	.316			76.00	24.60	1.23		
11	2.79	.359			75.00	26.87	1.40		
Aver.	2.98	.337	226		76.50	25.73	1.31	84	
<b>D</b>									
12	5.40	.294	197	185	91.20	14.16	1.48	95	152.5
<b>E</b>									
13	1.88	.532			70.20	19.78	2.04		
14	1.86	.538			77.20	22.04	2.27		
15	1.95	.527			86.80	23.51	2.57		
Aver.	1.89	.532	357	326	78.06	21.77	2.29	147	117.5

X - The cost basis of two engines is used for this item, none other being available.  
 A - A proper mean rating for this group should be .157 BHP/cu.ft./min.  
 Cost high.  
 B - A proper mean rating for this group should be abt. .273 BHP/cu.ft./min.  
 Cost very high.  
 D - Cost high.  
 E - Cost is high.

Table IV

## General Characteristics of Diesel Engines Offered Panama Canal

General Characteristics - Panama Canal Engines													
All two cycle engines have separate scavenging blowers.													
No.	Class & Make	1 BHP	2 MEP lbs. sq. in.	3 ME	4 IHP	5 MEP lbs. sq. in.	6 RPM	7 No. Cyl.	8 Bore & Stroke ins.	9 Piston Speed ft./min.	10 Total Cylinder Volume Cu. ins.	11 Total Cylinder Volume Cu. ft.	12 Total Cost These Engines \$
B	Two Cycle Single Acting												
I	Nordberg-Carels	3750	67.6	.75	5000	90.0	115.4	6	29 x 48	923	190,224	110.06	620,000
II	Busch-Sulzer	3750	67.6	.75	5000	90.0	125.0	6	30 x 42	876	177,873	101.12	655,000
III	Bethlehem	4300	72.4	.75	5740	96.5	115.4	8	26 x 48	923	203,864	117.97	794,129
IV	"	3750	72.2	.75	5000	96.3	115.4	7	26 x 48	923	178,381	103.23	704,680
	Aver.		69.9	.75		93.2				911			
C	Two Cycle Opposed Piston												
V	Sun-Doxford	3750	65.4	.90	4170	72.7	115.4	6	22.83 x 68	664	167,284	96.90	1,349,000
D	Four Cycle Double Acting												
VI	McIntosh & Seymour-Polar	4400	72.5	.80	5500	90.7	100.0	6	30 x 60	1000	254,448	147.25	897,446
VII	"	3750	74.2	.80	4690	92.7	100.0	5	30 x 60	1000	212,040	122.70	752,466
VIII	"	3750	80.2	.80	4690	100.2	115.4	4	30 x 60	1154	169,632	96.16	700,646
IX	"	3750	66.9	.80	4690	83.6	115.4	6	30 x 48	923	203,666	117.69	747,666
	Aver.		73.4	.80		91.7				1019			
E	Two Cycle Double Acting												
X	New London-NAM	3750	66.2	.80	4685	82.8	125.0	5	31.6 x 42	875	98,191	56.82	660,928
XI	Worthington	3750	60.9	.80	4685	76.2	125.0	4	28 x 42	875	103,437	59.85	658,000
	Aver.		63.6	.80		79.6				875			

B - These engines are rated about right.  
C - These engines appear underrated.  
D - These appear overrated as to piston speed.  
E - " " " " " "

engines proposed appear on the average slightly under-rated in the case of the 4-cycle and slightly over-rated in the case of the 2-cycle ones.

A list of the bids as submitted is shown in Table I which gives the data as published by the shipping board but with the cost of the soap tests eliminated. Table II gives the engines which have been selected for comparison with the technical data completed on the basis of our assumptions, together with their total published costs and arranged in their proper grouping. A consecutive number identifies each engine from Table I. Geared engines have been eliminated from Table II as not directly comparable on account of their different characteristics; likewise opposed piston engines have been classified separately as they constitute a class by themselves, somewhat half way between 2-cycle single-acting and 2-cycle double-acting. Separate considerations apply to these as we shall see later.

In order to make any kind of comparison of power between 2 and 4-cycle single and double-acting engines, it is necessary to compare each type again with an accepted standard. No such standard exists and authorities as well as manufacturers differ widely as to the output of each type and as to their limitations. A number of different designs exist in each class rendering comparisons without a standard merely academic. While in 4-cycle engines, the accepted cyclic function is carried out by means of poppet valves in the head, no other method having been found practicable, in the 2-cycle engines a number of different arrangements of valves

and ports is possible.

In theory, the 2-cycle engine is less efficient than the 4-cycle in point of thermal efficiency or fuel consumption; its advantages are purely practical, such as weight, space and cost. One disadvantage which is important is that practically twice the amount of heat must be dissipated in the same time, thus restricting pressures and velocities of gases and velocities of mechanical elements. But this holds true only if the two engines were compared on the basis of equal mechanical arrangement, and this is not possible. The nearest approach to the arrangement of inlet and exhaust valves in the head for the 4-cycle is the disposition of scavenging valves in the head with exhaust ports in the cylinder barrel for the 2-cycle.

#### Improve 2-Cycle Type

Of late, several variations in the 2-cycle method have been introduced, rendering it more efficient, such as double scavenging ports, valve controlled ports, supercharging, etc. so that some large 2-cycle engines have proved fully as efficient as 4-cycle ones and in a few cases, such as in the opposed piston types, where the scavenging air has a unallow action and the heat losses are less, slightly more efficient than the 4-cycle.

For all these reasons it is hard to reconcile all opinions and strike an average for mean effective pressure, mechanical efficiency, and piston speed which would satisfy all. Generally speaking, builders of 2-cycle engine keep the mean indicated pressure rather low, some go as low as 80 pounds per

square inch, others even as high as 110 pounds per square inch. It is not unfair, therefore to assign the value of about 85 pounds mean indicated pressure to the 2-cycle while the 4-cycle engine can be credited with about 90 pounds per square inch as specified by the shipping board.

On mechanical efficiency likewise, some 2-cycle engines have obtained remarkable results, the difference between the two types being accounted for principally by the scavenging pump, which takes about 5 per cent of the indicated power, so that if 75 per cent is assigned to the 4 cycle, 70 per cent should be a fair allowance for the 2 cycle.

As to piston speed, that is where the greatest source for disagreement exists. Two-cycle engines with port scavenging and port exhaust must necessarily go slower on account of lubrication requirements, proper lubrication being impaired by the openings in the cylinder barrel, while some engines with only exhaust ports in the barrel risk greater speeds than the former.

The leading makers adhere to about 650 to 700 feet per minute while some go as high as 750 feet and in the case of submarine engines even more. In the case of 4-cycle engines, greater speeds can be used with safety, but even there some makers prefer to keep the speed low, say between 750 and 800 feet per minute. But we have agreed to accept the shipping board limit for 4-cycle engines, while for 2-cycle engines, a compromise lower limit should be taken.

Summarizing the above thoughts, the governing characteristics for evaluating

the two types would appear as follows:

	4 cycle	2 cycle
MIP lbs. per sq. in. ....	90	85
Mech. efficiency .....	0.75	0.70
Piston sp. ft. per min....	900	750

If then a cylinder of the same size is taken for the two types and using the above limits, the 2 cycle is found to give 47 per cent more power than the 4 cycle.

In the case of the double acting engine, some deduction must be made for the underside of the piston. In large engines, the deduction for the piston rod area and the lower mean effective pressure obtainable may amount to 10 per cent of the upper side's power, but in small engines this deduction may amount even to 20 per cent, hence it is safer to take 15 per cent as a mean value. The considerations involving this phase are rather deep and highly debatable, hence it suffices for this discussion to assume this value as being more or less conservative and as a compromise.

Thus each type would appear to compare as follows:

4 cycle single acting .....	100
2 cycle single acting 115-161 mean ..	147
4 cycle double acting .....	185
2 cycle double acting 213-298 mean.	272

But in engines of unequal characteristics it is hard to make straight power comparisons unless they are brought to a common unit of output, and this seems to be cubic feet of down stroke piston displacement per brake horsepower per minute, or the inverse, brake horsepower per cubic foot per minute. This unit would also represent an index of efficiency in point of least cubic foot per brake horsepower per minute.

In Table III these values are given for each type, averaged for each group and compared with a standard as explained hereinafter.

Comparing again two cylinders of the same dimensions operating under 2 and 4-cycle principle, it is found that the 2-cycle gives about 76 per cent more power per cubic foot per minute than the 4-cycle, while the double acting of either type gives about 85 per cent more brake horsepower per cubic foot per minute on the basis of down stroke only, due to the above mentioned deductions. This then should be the standard of comparison for engines of diverse characteristics; thus we have:

BHP per cu. ft.  
per min.

4 cycle single acting .....	100
2 cycle single acting .....	176
4 cycle double acting .....	185
2 cycle double acting .....	326

In Table III, therefore, the average values listed for each group are compared with the established standard, and with the double acting on the basis of

down stroke only. On the basis of both strokes, the double acting 4-cycle would show 0.974 of the corresponding single acting power, while the double acting 2-cycle would show 1.714 of the corresponding single acting power with the proper deductions for the lower end.

Coming to the subject of cost, the cylinder volume only should be the basis of comparison and we have seen above that on this basis, the 2-cycle takes about 32 per cent less cubic inches; inversely the cost of a 4-cycle should be 47 per cent more. But the 2-cycle has one more working element which is the scavenging pump and, therefore, should cost more on this account, hence a proper deduction for this reduces the 4-cycle

by the lower cylinder head with its deep stuffing box, and assuming that the cost increases in the same ratio if the same unit of pounds per man per hour is used, the actual cost of the double acting versus the single acting will be the mean of 15 to 20 per cent or 117½ per cent of the cost of the latter. Hence if the 2-cycle single acting is taken at 100, the comparison of cost results approximately as follows:

	\$ per BHP	\$ per cu. in.
2 cycle single acting	100.0	100.0
4 cycle single acting	130.0	130.0
2 cycle double acting	64.0	117.5
4 cycle double acting	83.0	152.5

Let us now turn to Table III and see how the above evaluations compare.

Table V  
Comparative Characteristics, Panama Canal Engines

Comparative Characteristics - Panama Canal Engines									
No.	1 Cu.ft./ BHP/ min.	2 BHP/ cu.ft./ min.	3 Actual Ratio BHP/cu.ft./min.	4 Standard Ratio BHP/cu.ft./min.	5 \$/BHP	6 cu.ft./ BHP/min.	7 \$/ cu.in.	8 Actual \$/cu.in. Ratio	9 Standard \$/cu.in. Ratio
			A = 100	A = 100					
B									
I	3.36	.297			55.10	16.40	1.07		
II	3.37	.297			58.20	17.26	1.08		
III	3.12	.321			61.68	19.72	1.29		
IV	3.06	.327			62.60	20.46	1.32		
Aver.	3.22	.310	176	176	59.36	18.46	1.18	100	100
C									
V	2.98	.336	187	...	119.85	40.25	2.69	...	...
D									
VI	3.34	.299			67.95	10.77	1.18		
VII	3.27	.305			70.45	11.42	1.25		
VIII	3.02	.331			62.25	10.92	1.20		
IX	3.79	.265			66.45	9.06	1.22		
Aver.	3.35	.300	170	185	65.77	10.54	1.21	102.5	152.5
E									
X	1.89	.529			76.50	21.43	2.95		
XI	1.73	.578			58.50	18.24	2.19		
Aver.	1.81	.553	314	326	67.50	19.83	2.57	218	117.5

B - These engines being rated about right, the Standard ratio of BHP/cu.ft./min. is assumed for them.

C - These engines slightly underrated.

D - These engines are overrated as to P.S.

E - These engines are overrated as to P.S. and underrated as to MIP (MIP should be higher than on S.B. engines on account of omission of scavenging pump).

excess cost down from 47 per cent to 30 per cent.

In the case of double acting engines, we already have established the fact that we can obtain 85 per cent more power for the same cylinder volume, counting down stroke only, but we must consider that for this the double acting must be from 15 to 20 per cent taller, which for the sake of approximation should bring about a similar excess in weight than the single acting. This extra height and weight is accounted for by the extra length of cylinder barrel and

Costs are shown on the basis of one engine bid.

In group "A" we see a wide fluctuation of costs, while we have already mentioned that the engines appear under-rated. If properly rated, the price per brake horsepower would come down to the extent that some individual case would appear very attractive while others would come out just about right. In group "B" we see a wide discrepancy in costs. Should group "A" costs come down to an average of \$90 per brake horsepower group "B" costs should av-

Table VI  
Comparison of Shipping Board and Panama Canal Diesel Engines

Summary of Comparison of Data Shipping Board Engines vs Panama Canal Engines Based on Prices for Three Engines  
- Averages -

Group	1. Index and Ratio of Output B H P/cu.ft./min.					2. Index of Efficiency Cu.ft./BHP/min.		3. Index of Power Cost \$/B H P		4. Index of Reliability \$ cu.ft./BHP min.		5. Index of Manufacturing Cost \$/cu. in.				
	Standard Ratio	Actual	S.B. Ratio	Actual	P.C. Ratio	S.B.	P.C.	S.B.	P.C.	S.B.	P.C.	Standard Ratio	Actual	S.B. Ratio	Actual	P.C. Ratio
A	100	.149	100	...	100*	6.70	....	94.60	.....	14.13	.....	130	.76	54	....	...
B	176	.266	178	.310	176*	3.75	3.22	100.26	59.36	27.41	18.45	100	1.41 <sup>9</sup>	100	1.18	100
C	...	.337	226	.336	187	2.98	2.98	76.50	119.85	25.73	40.25	...	1.31	93	2.69	228
D	185	.294	197	.300	170	3.40	3.35	90.30	65.77	14.04	10.54	152.7	1.46	173	1.21	102.5
E	326	.532	357	.553	314	1.89	1.81	68.50	67.50	19.17	19.83	117.5	2.01	142	2.57	218

\*Standard ratio assumed, see Table No. 5.

o 2400 BHP Bethlehem engine with separate blower is included in this average.

erage at least \$70 per brake horsepower thus establishing very nearly the proper relationship between the two groups.

Considering the double acting groups, logic tells and the above considerations show that double acting engines should be cheaper than single acting ones in their respective class. Personally, we contend that diesel conversions cannot be profitable to shipowners unless diesels are purchased at about \$50 per brake horsepower or less and the double acting engines can and must do this.

In the case of the opposed piston engines, aside from the fact that the mean indicated pressure exceeds the shipping board requirements, we can find no fault with the technical characteristics with the exception that No. 11 engine is rated slightly high compared with accepted practice. But then the cleaner scavenging of this type, together with a lower ignition pressure, due to the solid injection system, warrants slightly higher mean indicated pressure. In addition, their higher thermal efficiency puts them in a class by themselves. They stand, therefore, as a middle ground between single and double-acting engines with a cost rather favorable for this class and they form an advantageous installation where length of engine room is at a premium.

Let us see now how these results compare with the Panama canal bids of July 31 this year. The Panama canal specifications were for three engines of 3750 brake horsepower each, direct-connected to alternating current generators and while the main difference is the nonreversibility and the regulation, these engines are of a size comparable to those of the shipping board.

Table IV gives the principal characteristics of the Panama engines together with their cost without spares and tests. The cost of three engines is given. Group "A" being represented only by geared engines, is not shown as not being directly comparable.

In the case of the Panama canal, we find that the 2-cycle single acting engines are rated about right, with perhaps a little too low mean effective

### An Accurate Analysis

*THE letter by H. M. Hitchcock published in our October issue criticising the analysis of the Panama canal bids for diesel engines which appeared in our September issue was to the point. Mr. Hitchcock is correct in pointing out the shortcomings of this analysis as published but unfortunately such comparisons were not meant to be scientifically correct, first because all the technical characteristics of the engines under discussion were not available at the time, and second because it was meant to bring home to our readers the fact that estimating diesel costs in this country is in its infancy and shipbuilders in particular are wide of the mark.*

*A more accurate estimate, which is presented here, of the Shipping board bids supplemented by a comparison on the same basis of the Panama canal bids, and which by the way, was prepared for MARINE REVIEW by experts without any knowledge of Mr. Hitchcock's letter, seems to answer Mr. Hitchcock's criticism.*

*But even this analysis is not scientifically accurate. It is based on certain assumptions forced by the shipping board's limits in piston speed and mean indicated pressure which can not be wholly ignored, especially the latter, which is arbitrary and not correct unless cylinder diameters are taken into consideration. It is also based on certain other assumptions which had to be made on account of the lack of information on designing data which must obviously come from the principals under discussion and which are not always willingly furnished. This analysis is however, sufficiently accurate to eliminate the objections mentioned by Mr. Hitchcock and which were anticipated when the previous analysis of the Panama canal bids was written.*

EDITOR.

pressure. It must be noted that all the 2-cycle engines submitted for this project have separate scavenging blowers; hence an exact direct comparison is not possible. The absence of the scavenging pump should bring the mean effective pressure to a little higher level than that shown, with no higher mean indicated pressure. These engines should, therefore, be a little higher than the shipping board engines in point of dollars per brake horsepower because of the extra cost of independently driven blowers. Table VI shows that such is not the case, in fact the contrary prevails and the difference in favor of the Panama canal engines in some cases is greater than the cost of the reversing gear would lead us to believe. All the other groups are not appreciably out of proportion as to technical characteristics. It is in point of cost where the greatest contrast exists. Table V gives cost factors compared with our established standard.

We summarize the different results in Table VI comparing the two sets of bids as follows:

In column 1, we compare their brake horsepower per cubic foot per minute with our established standard. This should constitute an index of power or output. In column 2, an index of efficiency is given represented by the least cubic foot per brake horsepower per minute. In column 3, an index of power cost is shown; this is the unit of cost most alluring to the purchasing agent. Column 4 gives the index of reliability in point of cost per cubic foot per brake horsepower per minute. The engine which shows the least cost for the greatest cylinder capacity is the cheapest in the long run on account of its longer life even if the output is lower. Finally column 5 gives an index of manufacturing costs as compared with the standard.

In conclusion, our considerations regarding a standard of comparison assume that a fairly high degree of manufacturing standard is maintained. Manufacturing costs vary with the different shops, so does the personal element and

the skill of the technical staffs. The standard of comparison has at least the merit of showing relative values between types sufficiently approximate to bring to the surface glaring fluctuations in general characteristics and in price. Certainly a more properly balanced conception of relative value is due for the sake of the industry both from a national point of view and in comparison with foreign competition.

## Silencer Stops Noise of Exhaust Gas

One of the recent interesting developments in marine engineering is the high efficiency silencer for exhausts and suction. Safety when navigating in crowded waters or in fog demands absolute quiet on the bridge, as even very moderate noises can obliterate and confuse the faint sounds from distant bells and whistles. Thus, with the coming of the internal combustion engine, has come the exhaust and suction silencer.

Dr. Hiram Percy Maxim, inventor of the Maxim gun silencer, is responsible for this new device. In a recent illustrated paper delivered before the American Society of Mechanical Engineers at Hartford, Conn., he explained for the first time the possibilities of the new device. On 6-cylinder engines of 1000 horsepower and of 2-cycle design, it is claimed that a silencer will not only completely eliminate the sound of the exhaust, so that it is inaudible at a distance of 20 feet, but it actually helps the power of the engine and reduces fuel consumption. This is brought about by making use of the so-called "stack effect," well known in stationary practice. This "stack effect" consists in setting a column of gas in motion and so controlling the motion that at the instant of closing of the exhaust ports, the inertia of the moving column of gas actually draws a partial vacuum in the engine cylinder. This increases the scavenging and of course improves operation.

A noise trap filters out the sound waves from the gas, and the result is a silencer which eliminates noise and yet imposes no loss of engine power.

The air suction of these larger engines can also be equipped with the suction silencer, so that the noise of the air inlets can also be eliminated without loss in the quantity of air drawn in.

Many recently built tugs, barges and ships have been equipped with both forms of these silencers. Their builders report construction under way of silencers as large as 30-inch exhaust pipe size for the large engines intended for the shipping board conversion program.

## Designs 2-Seated Piston Ring

Piston rings are used to prevent loss of efficiency due to leakage of the actuating medium, such as steam, air or gas, through the space between the cylindrical surface of the piston and the cylinder wall. The prime purpose of any piston ring, therefore, is that it should serve as an efficient seal. In order to accomplish this purpose and to give long life to the ring and a minimum of wear on the cylinder, it must be properly and accurately made to the correct size of the best material. The design of the ring, however, also is of the greatest importance if it is successfully to accomplish its purpose. It has been found that a plain ring even when accurately made of good material is not entirely satisfactory. Careful study and long experience have brought about a number of modifications of the simple one-piece ring for the purpose of perfecting this very necessary aid to economy. Many rings of special design in two or more parts have been developed and used with varying degrees of success.

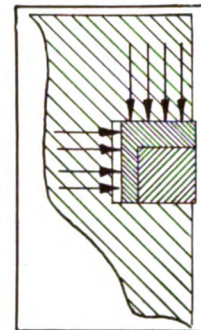
Judged on the basis of the soundness of the theory on which its design is based and its practical application in a number of engines, a 2-seated piston ring developed by Lewis Kinsley, Philadelphia, and J. W. S. Moss, New York, and manufactured by the Hope Machine Co., Philadelphia, appears to meet all the conditions of a successful piston ring. There are two members to this ring and its design may best be shown in the accompanying cross section sketch.

This ring has little initial tension. Pressure of the actuating medium will be applied as shown by the arrows in the sketch. The pressure will seat the ring firmly against the lower lip of the groove in the piston and will also be exerted to bring the ring into contact with a cylinder wall. The best material obtainable is used, a close grained cast iron of special properties in which there is more than the usual amount of graphite. The rings are cast individually by a process designed to eliminate blow holes and porosity.

Both members of the ring are of approximately the same strength and size. The master member is L shaped and is, therefore, of nearly the same strength as the one-piece ring, while the sealing member which fits into the L of the master is of square section having two-thirds the width and depth of the master ring, at the gap. Pressure is communicated to the seal-

ing ring by means of the master ring. Both members are in metal to metal contact with the lower side of the groove in the piston and, therefore, cannot pound back and forth, with chance if breakage, as direction of motion of the piston changes. Best modern practice is followed in casting the master member out of round and slightly eccentric. It is then gapped and machined to take the sealing member. The master and sealing members

clamped together are then machined as one. A lug on the sealing member sets into the gap in the master member so that the two always bear a fixed relation to each other. Friction against the cylinder walls is reduced to a minimum, due to the grade of metal used with high graphite content,



NEW TYPE PISTON RING

and the low initial tension. The ring is pressed tightly against the walls of the cylinder only during compression and expansion stroke. Leakage is stopped by the effective work of the sealing member at the gap of the master member, both at the face of the ring and at the side away from the pressure. Therefore, leakage is prevented, across the face of the ring, through the gaps or through the groove. The wear of both members will be uniform. All rings of the same nominal size are interchangeable. They are also with rare exceptions, interchangeable with plain rings.

It is also claimed that this type of ring is adaptable to worn cylinders because it is more flexible and because the pressure behind the ring can not pass by but continues to press the ring out against the cylinder wall. It is easy to install as each part being more flexible than a single ring is put in place separately. Also the chance of breakage is reduced. It is of the utmost importance for the successful application of this ring that the side of the groove away from the pressure and against which the sealing side of the ring must seat, be true without shoulders and at right angles to the face of the piston. The upper or pressure side of the groove does not need to be trued up and liberal side clearance is recommended for all installations.

Charles C. James has been made vice president of the Alderton Dock Yards, Ltd., Brooklyn.

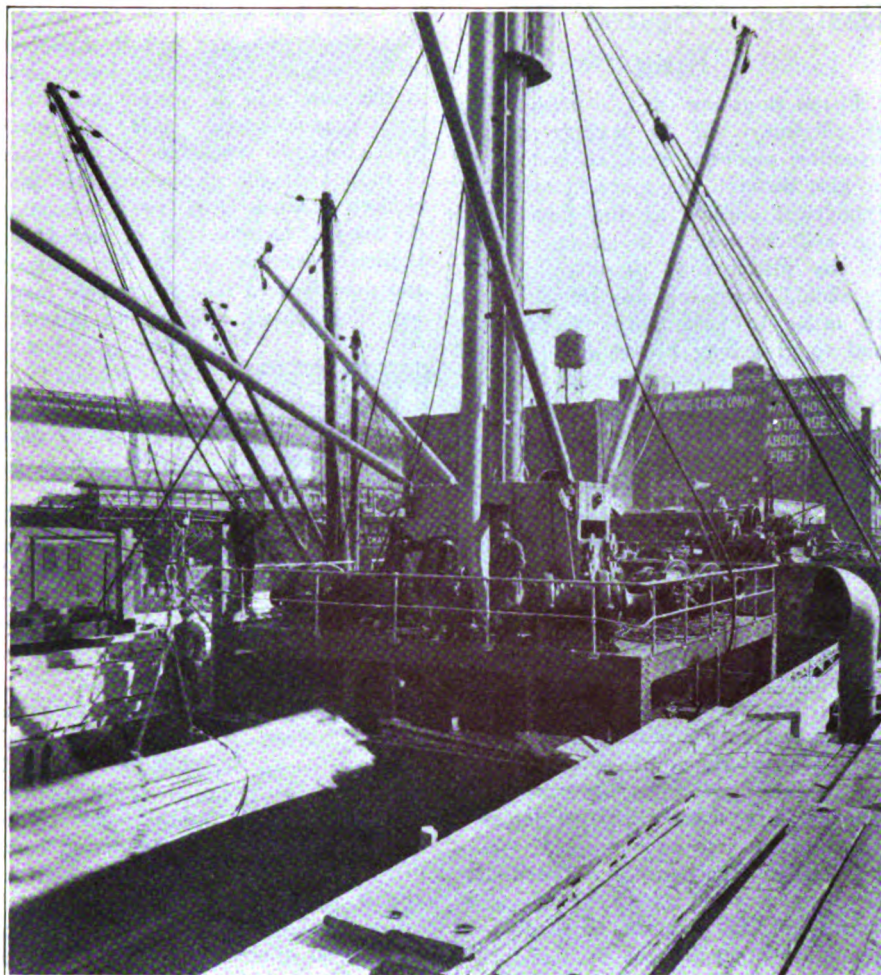


FIG. 8—UNLOADING LUMBER FROM THE SEEKONK

## Care and Use of Electric Winches

(Continued from Page 460)

three years, during which time the success of the Westinghouse deck equipment has undoubtedly been the direct cause of subsequent orders for winch electrification.

The electric energy for the motors and lights is supplied by diesel electric generating sets.

### High Rope Speeds Are Possible

The WILLIAM PENN has ten 3-6 ton cargo winches described previously in this article. Fig. 7 shows a group of four of these winches having the watertight resistor cases grouped around the mast where they can be conveniently held together and bound to the mast firmly by means of spacing plates. The stern warping winch is shown in the background of this picture. This winch has a straight reversing controller to make its use convenient for warping the vessel; otherwise the electrical equipment is the same as that for the cargo winches.

With the controller handle for the

cargo winch on the last notch, the following rope speeds are possible, using high gear:

Hoisting	Feet per minute
Light hook	462
1½ tons	240
Lowering:	
Light hook	300
1½ tons	430

An interesting advantage of the elec-

trification of winches became apparent to shipowners in this country shortly after the WILLIAM PENN was commissioned. This is the possibility of readily connecting, in the electric circuits, watt hour meters by means of which the power requirements of the winches can be definitely determined over any period desired.

Investigations of this nature made in connection with steam equipment are attended with much difficulty. This explains in a measure the lack of reliable information in the past concerning water rates obtained from actual cargo handling, steering, mooring, or windlass operations, using steam equipment; and in fact all others to which electric power is now applied.

Although this advantage alone is not of sufficient importance to influence the shipbuilder to purchase electric equipment, it is a fact welcomed by the operating personnel and even the designers of steam equipment. These men can check from the modern electric installations the power requirements of the service in which they are interested.

Results of this nature recorded on board the motorship SEEKONK will be set forth under the remarks for that vessel.

### Motorship "Californian"

Even though approximately 250,000 tons of cargo has been handled, there has been comparatively little spent by the operators in order to maintain the winch equipments on board the WILLIAM PENN. This vessel is now in service, making regular trips around the world, calling at the following ports: New York, Savannah, Panama, Honolulu, Yokohama, Kobe, Shanghai, Foochow, Swatow, Hong Kong, Manila, Cebu, Surabaya, Singapore, Port Said, Marseilles, London, Rotterdam and Liverpool and, therefore, the winches have been operated by stevedores of many races.

The CALIFORNIAN, a twin screw vessel

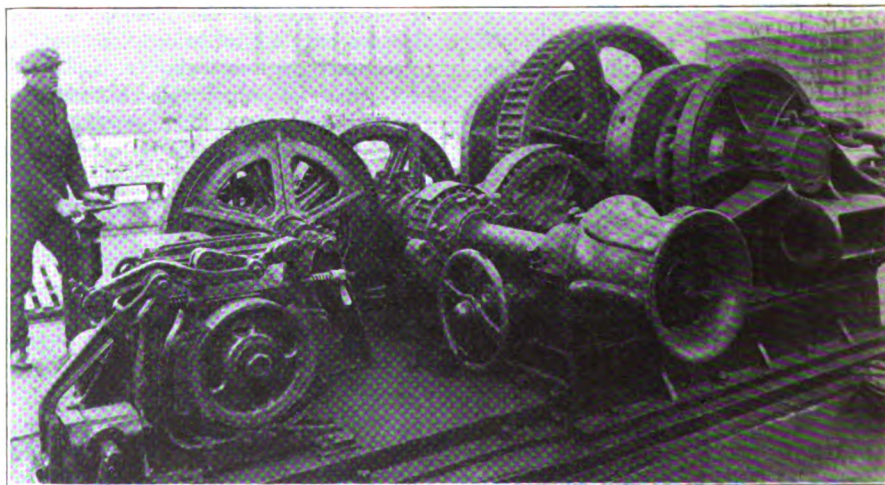


FIG. 9—CONVERTED STEAM WINDLASS ON THE SEEKONK WITH ELECTRIC MOTOR, BRAKE AND ADDITIONAL GEAR REDUCTION

of 11,000 deadweight tons, operated by the American-Hawaiian Line, is engaged with a fleet of other ships in trade between the Atlantic and Pacific ports of this country, namely, New York, Philadelphia, Boston, Charleston, Los Angeles, San Francisco, Oakland, Seattle, Tacoma, Portland and Astoria.

This vessel has 14 American Engi-

capacity of 7754 tons, and converted this vessel into a motorship having diesel engine propulsion and fitted with diesel electric sets in the engine room for the auxiliary power. The SEEKONK is operated by the United American Lines between Baltimore, New York, Savannah, Canal Zone, Los Angeles, San Francisco, Columbia river and Puget

total power and that required by the winches only. On her maiden voyage, these meters were read each day, also the consumption of fuel oil was recorded. During this voyage, 9489 tons of cargo were handled for which the kilowatt hours were 5470, and the cost of the fuel consumed, \$55. Therefore, to produce this energy at a cost of a trifle

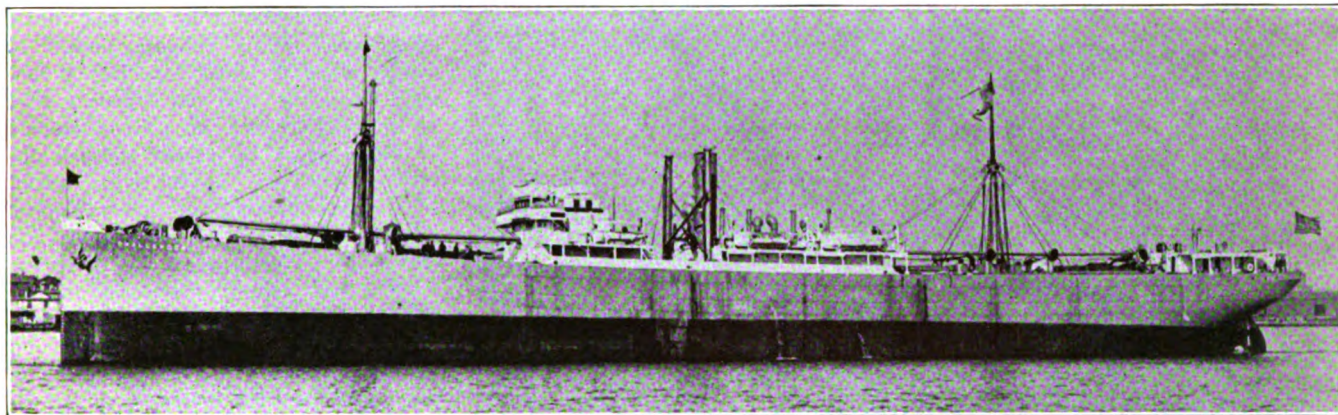


FIG. 10—MOTORSHIP CHALLENGER CONVERTED FROM STEAMER AND FITTED WITH ELECTRIC AUXILIARIES

neering Co.'s double geared winches similar to those already described for the WILLIAM PENN, and two Shepard Crane & Hoist Co.'s winches, operating on the mechanical load brake principle, and requiring straight reversing control equipment instead of that giving dynamic braking when lowering. Westinghouse motors, brakes and controllers are used for considerably more than the deck machinery on this vessel. Diesel electric sets supply the electric energy for the power and lighting, with fuel consumption, while tied up at dock, from 3 to 5 barrels of fuel oil a day, depending upon the weight and amount of cargo handled and hatches working at full capacity. Considerably more than 200,000 tons of miscellaneous cargo has been very satisfactorily handled by these winches.

One great difference is found, namely the housing of the starting, regulating and brake resistors, in which the arrangement of the electric equipment for the CALIFORNIAN differs from that of the WILLIAM PENN.

The CALIFORNIAN has carried electrical spares for a little over two years. She has had occasion to use some parts, yet much of the original stock is still on hand, despite the fact that she has about 50 per cent more winches than the ordinary vessel of smaller size, or even the WILLIAM PENN of her own size.

#### Steamship "Seekonk"

The William Cramp & Sons Ship & Engine Building Co., purchased from the shipping board, the single screw steamship SEEKONK, having a deadweight ca-

Sound ports. Fig. 1 shows the SEEKONK. In Fig. 8, a view is shown of the deck load of lumber surrounding the "island platform" upon which four winches are mounted. The mounting of the winches in this manner facilitates the loading of lumber as shown. Below this platform is the deck house for the protection of the winch resistors and electrical stores. Fig. 9 shows the converted steam windlass with the electric motor, brake and additional gear reduction mounted on an extension of the old bedplate. This picture tells of "the passing of the old and the entrance of the new."

The SEEKONK winches, of which ten were constructed by the William Cramp & Sons company, are compound geared, having a  $1\frac{1}{2}$ -3 ton rating. Westinghouse 20 horsepower series wound motors of the type already described, are used to drive the winches. The light hook hoisting speed is 470 feet per minute.

A 2500-pound draft can be hoisted in high gear at 213 feet per minute, and 5500 pounds on low gear at 110 feet per minute.

The advantages of incorporating in the ship's structure, small deck houses, especially for the protection of resistors and overload protective devices, have already been given in this article. The matter is of sufficient importance for shipping men seriously to consider additions of this nature which make a part of the electrical equipment more accessible.

The watt hour meters, to which reference has been made, are connected in circuit on the SEEKONK so as to give

over  $\frac{1}{2}$  cent per kilowatt hour at the switchboard, represents a cost of slightly over  $\frac{3}{10}$  cent for handling each ton of cargo.

Over 50,000 tons of miscellaneous cargo has been successfully handled. Within the first year's operation of the SEEKONK, no expense has been needed for up-keep of the electric deck equipment, other than the usual allotment of spare parts.

#### Motorship Challenger

The CHALLENGER, a single screw steam vessel of 11,620 tons deadweight capacity, was purchased from the United States shipping board by the Sun Shipbuilding Co., and converted recently into a motorship, driven by a 3200 shaft horsepower Sun-Doxford opposed-piston diesel engine. The deck machinery and the engine room equipment are driven by Westinghouse motors. Diesel engine sets having Westinghouse generators are also used on this vessel. A view of the CHALLENGER is shown in Fig. 10.

Ten  $1\frac{1}{2}$ -ton winches and one capstan on this vessel are driven by 20 horsepower series wound motors. One warping winch has a 30-horsepower compound wound motor. This larger winch is compound geared having capacities of  $2\frac{1}{2}$  tons at 160 feet per minute or 5 tons at 80 feet per minute. The marine type motors for these winches are of the same design as that previously described.

The capstan and warping winch have controllers giving straight reversing connections. The cargo winches have a capacity of  $1\frac{1}{2}$  tons at 250 feet per minute for which controllers with dynamic braking lowering connections are

used. Provision on this vessel is not made for protecting in deck houses the resistors for the winch equipment. Since there is no space for these resistors below the shelter deck, the Westinghouse company has furnished special watertight resistor cases which can be properly ventilated when the winches are in

more. With advent of the motorship, the attention of marine engineers was seriously directed to the use of electric drive for engine room auxiliaries and those exposed on deck. Only in comparatively few cases did the builder of the motorship consider the use of a steam plant for the operation of the

ditions, the little economy which would ordinarily result from the expansion of steam, is lost; also as a result of wear in the engine parts, the effect of leakage and reduced efficiency is present to a greater degree, as the equipment gets older. The efficiency of the electric motor is affected but slightly on account of wear.

A still further loss appears in the form of condensation in the long steam pipes, and return exhaust lines. In winter, when the machinery is not running, either the lines and cylinders must be carefully drained, or a slight amount of steam must be passed through the systems which are exposed to the weather, so that freezing of the equipment may be prevented. Electric cables do not freeze; furthermore, the bending, warping or natural movement of the ship's hull has no injurious effect upon the wiring layout, whereas constant inspection and tightening of the joints in the steam lines are necessary to prevent leaks—a constant source of danger and often considerable expense when the leaking of water or steam is in the proximity of the cargo.

Heating, sweating and fermentation may be caused by a small amount of moisture communicated to some article of which examples are rice, sugar, hemp, grain, wool, oakum, tobacco, leather, flax, lime, felt, hay, starch, jute, cotton, chocolate, coffee, coal, cheese, charcoal, and ashes. Many of the goods mentioned above will be rendered entirely worthless in the presence of moisture. Spontaneous combustion may result in some cases, in others the strength of noxious odors and the activity of vermin may be increased.

Especially when combined with moisture, heat radiated from steam pipes, passing through the cargo spaces, increases bacterial activity, and as a result will damage perishable foodstuffs. Barrel staves may part under high temperature and permit the goods held in casks or barrels to waste by leaking outward, or render the containers weaker, so that eventually, partial or complete loss of the contents may be the result.

Ice, tallow and wax are examples of commodities that melt at a comparatively low temperature, not only damaging themselves, but also other cargo with which they come in contact, if the heat becomes excessive. The operations of loading or discharging may even be affected, as when a cargo of asphalt fuses and must be dug out from the place of stowage.

The heat radiated from steam pipes passing through or near living quarters is an objectionable feature, which is entirely eliminated by the transfer of

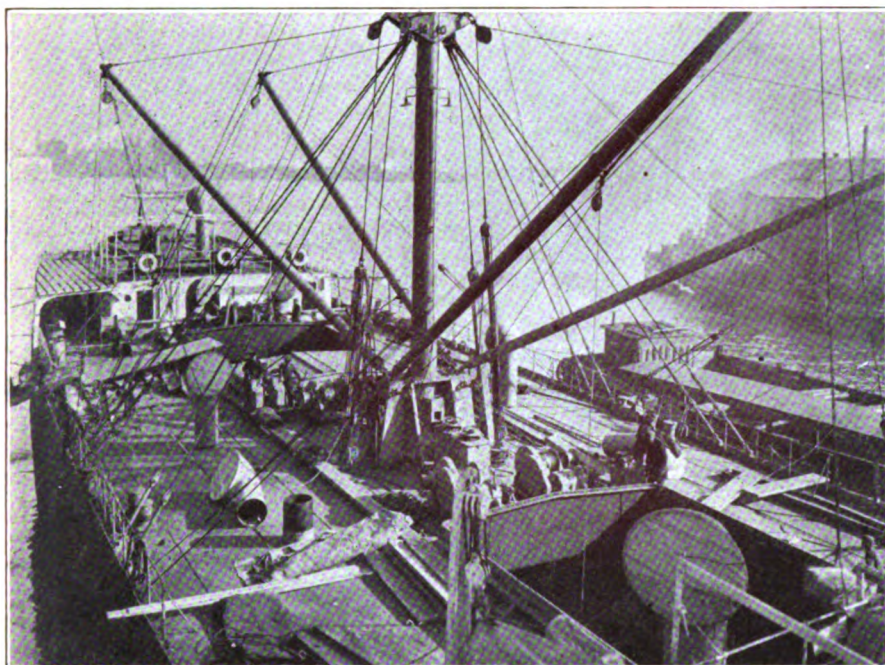


FIG. 11—DECK OF CHALLENGER SHOWING TWO WATERTIGHT RESISTOR CASES MOUNTED NEAR MAST

use and entirely closed when they are idle. Fig. 11 shows a view of two of these watertight resistor cases mounted near the mast.

The usual allotment of electrical spares is carried by the CHALLENGER. Her chief engineer states that during her recent trip around the world, the winches handled over 40,000 tons of cargo without replacing a single part on the winches. Not a single spare package was opened.

On this last trip an estimated distance of 25,000 nautical miles was covered in 5 months and 28 days, of which 18 days of bad weather were spent in the Indian ocean when the speed was reduced from an average of 10 knots to one-half of this value. The waves washing over the shelter deck were defied by the watertight motors and control equipment.

The trip included eastern United States ports, Panama, Honolulu, Philippine Islands, Java, Sumatra, Malay Peninsula and return to Philadelphia.

The winches were operated by Filipinos at Honolulu, Manila, Iloilo, Cebu and Zamboanga; by Javanese at Samarang, Cheribon and Batavia; by Malays at Singapore; and usually foreign born citizens of the United States at Philadelphia, New York, Boston and Balti-

auxiliaries. Of course, in these few cases, he also provided enough steam for heating the vessel, and probably in the last analysis, this, together with the lower first-cost of the auxiliaries, was the only justification. If there was formerly an element of uncertainty as to the reliability of the electric drive, this does not exist now in the light of the many magazine articles, published reports, testimonials, etc., indicating the successful application of electricity on shipboard.

The matter of economy is of great importance. If one goes to the published reports of the chief engineer of the SEEKONK, one observes that about one pound of oil, or the equivalent of a little over 3/10 cent (oil at \$1 per barrel) is needed to handle one ton of cargo. Over ten times this amount of oil was required per ton for handling cargo by means of steam winches on the HOG ISLAND class of steam vessels to which the SEEKONK originally belonged.

In order to have full torque at all parts of the stroke, so that full starting effort may be obtained at all times, also in order to make use of the reversing throttle valve for certain kinds of winches, no cut-off of steam in the cylinder is possible. Under these con-

electrical energy over suitable cables.

The reduction of noise and vibration is especially noticeable where the electric gear has replaced the reciprocating steam engine. This fact is especially true in connection with the steering gear and should be of special interest to operators of combined passenger and cargo vessels. In connection with both steam and electric cargo winches, the port engineer of a large shipping company has remarked "many operators are inclined to believe that the electric winches are slower than those driven by steam. However, our daily records show that we move cargo as rapidly with the one as with the other". The reason for this general belief may also be the fact that electric winches are not noisy and therefore, one is inclined to believe that they are "loafing on the job." This is not true. The *CHALLENGER* broke the daily loading record at Philadelphia even though the stevedores were unfamiliar with the operation of electric winches.

The location of cargo winches should be such that the drift between the leader block at the heel of the boom, and the drum of the winch is sufficient to insure even winding. In addition to this fact, the steam winch must usually be placed near the hatch opening so that the operator, who should be able to look down the hatch, can operate the throttle at all times conveniently. This last requirement is not imposed on the electric winch for which the controller is separately mounted, and can be conveniently located very near the hatch coaming, if desired. The electrical industry can go even further than this, and supply portable master controllers for deck service.

Going forward of the winches on shipboard, one comes to a piece of machinery—the windlass—which is exposed to a great amount of spray from the bow waves, chopping of the sea, etc. In cold weather, the windlass is likely to be coated with considerable ice. If electrically driven on the exposed deck, the motor also has its white covering. However, since there are no reciprocating parts to become jammed with the ice, it is perfectly possible for the electrician to turn on the current, start the motor, and break up any fouling of the rotating equipment. With a steam windlass under similar condition, the use of an axe is usually required to free the reciprocating parts. Also the steam cylinders may be cracked, or if they are not, condensation in the pipes and cylinders will be excessive. Unlike the electric motor, the engine will be unable to give maximum effort at the very

time when it is urgently needed.

An advantage of considerable importance in favor of the electric auxiliaries on shipboard becomes apparent in certain instances where the shore power is of the same character as that on the vessel in question. In this case, shore cables can be connected to the ship's switchboard, and the shore power supplied throughout the vessel instead of that from the regular ship's sets.

The advantage to be gained by this substitution of shore power is obviously greater where the steam driven sets, together with the boiler equipment, can be taken out of service, than it would be if the diesel sets on board are to be shut down. Privately owned lines having regular ports of call can provide shore power connections for serving the electrically equipped vessels.

Discussion already has been made in connection with electrically driven auxiliaries, of the possibility of readily connecting in the electric circuit, indicating or recording meters by means of which the power requirements can be definitely determined. Electric meters can be much more conveniently installed than those which record the flow of steam.

As regards space, weight and first cost of the deck equipment, the steam auxiliaries usually possess the advantage over the electric. However, since the operating expenses make up the major part of the total cost of the machinery, the entire picture is not presented with the idea of the first cost. The slight additional space and weight consideration is, we believe, offset by the higher economies and greater conveniences obtained with the electric drive.

## Contracts for Silencers

Silencers as developed and manufactured by the Maxim Silencer Co., Hartford, Conn., are used for diesel engine exhausts. Silent operation is generally recognized as tending toward better operation. Recently this company has made the following installations: One 12-inch size for the 1150 horsepower engine in the new dredge *DIESEL* of the United Dredging Co., Galveston, Tex.; one 5-inch and one 8-inch on the exhausts of the 135-horsepower and the 375-horsepower Lombard type engines installed in tug boats of the Long Island Machine & Marine Construction Co.; two 8-inch size in the new Standard Oil Co. tanker on the exhausts of two 400 horsepower engines and one 8-inch size for a marine engine operated by the Texas Co., New York.

## Use of Electricity Aboard Ship

By P. E. Kriebel

Ten years ago, it might have been a different story because the electrical manufacturers in spite of experimentation and a persistent propaganda, had not reached the perfection of the present day.

The navy department helped and encouraged them in their research and experiments to the point that the latest and best ships, including battleships, scout cruisers, airplane carriers, etc., are all driven, and figuratively clothed, fed and surrounded by electricity. Through this patriotic and laudable encouragement, the manufacturers have been able to solve many problems regarding the application of electricity to marine use.

As a result of this, the manufacturers have been in a position to use this experience in merchant marine problems, and have been able to produce a good economical application of the electric motor to practically every use aboard ship.

They have perfected motors of a type, controls of a design, and other elements of electrical appliance for this use which are not only unusual in response and efficiency, but were unheard of and thought impossible by experts a short time ago.

The heavy mill type motor with plenty of copper to take care of the heat rise, totally enclosed, absolutely watertight, submersion proof, capable of running in the tropics or encased with ice, is a product of these experimentations. What does that mean for use in an emergency or on reaching port? The answer is evident.

Flexibility of control is another item not to be passed over lightly, because the controller can be located at the hatch where observation of the operator speeds up the work and prevents damage. It is recommended that for spur geared drive, such as is required on a cargo hoist or windlass, a compound wound motor be used with solenoid brake, to hold the load in the event of current failure. Worm driven machines, such as capstans, gypseys, and worm driven windlasses, should have series wound motors, because of the fact the non-overhauling feature of the worm prevents the motor from running away on light loads. If the worm is a single lead, no solenoid brake is required because of its nonoverhauling feature.

The author, P. E. Kriebel, is marine sales manager, American Engineering Co., Philadelphia.

## More Electrical Uses

(Concluded from Page 501)

confidence in the economy, reliability and convenience of installation and operation of this class of machinery and the superiority of electrical apparatus is quite generally recognized.

In this country, the first successful installation of diesel electric propulsion was made in 1920 on the 500-ton trawler *MARINER*.

At the present time, more than 30 ships are equipped with diesel-electric propelling machinery, varying from 100 shaft horsepower up to and including installations of 2500 shaft horsepower. In this group are represented various types, cargo boats, tankers, ferry boats, dredges, yachts and tugs. In all of these,

electricity supplies not only the power for propulsion but operates below-deck auxiliaries, deck auxiliaries, lighting and other services.

Today on first-class vessels, one finds that an electric generator is supplying a multitude of services. Electric motors operate boat hoists and cranes, capstans, anchor windlass and steering gear. In the modern galley, electric appliances are found throughout, and even the shaving water is heated electrically. Electric current flows through tiny miniature signal lamps, or casts its white beam from the 36-inch searchlights. From the gyroscope on the bridge to the floodlight on the colors, electricity offers its flexible service.

It has been thought by some that the cost of electric equipment is consider-

ably more than that of steam equipment. While certain individual pieces of machinery, such as deck winches, cost more when provided with electric motors and control apparatus than when driven by steam engines, the cost of the installation as a whole, including electric cables in place of steam and exhaust pipes, and also including the labor of installation, is neither prohibitive nor excessive when the advantages of operation and maintenance are considered.

The increasing use, during the past few years, of electricity aboard ship both for propulsion machinery and for driving the auxiliaries is indicative of a growing appreciation of the safety, economy, flexibility and reliability of electric power.

# Test British Type of Oil Separator

A NUMBER of tests and demonstrations were carried out at Southampton, England, during the first half of September with the Pirbright oil separator. The tests were conducted under the supervision of John E. Hackford, adviser to the British government's petroleum department. Perhaps the most interesting of these demonstrations was that which was carried out on the discharge water of the Atlantic liner *LEVIATHAN* on her arrival from New York on Sept. 13.

The oil separating plant was installed in the Pirbright steel lighter, *J. TAYLOR PEDDIE*. The apparatus consists of two parts known as No. 1 and No. 2 plants, No. 2 plant being also called the filter. About 300 tons of oily ballast water were pumped out of the *LEVIATHAN* at various rates up to 200 tons an hour. At all rates, the separation was effected and the water was discharged into the harbor without a trace of oil, either from No. 1 plant or from the combination of both plants. The oil was recovered and passed into oil tanks on board the barge fit to be pumped back into the ship's fuel tanks and used in the furnaces.

Chemical analysis of samples taken at various times during the operation showed that the water discharged from the *LEVIATHAN* contained varying amounts of oil as the pumping proceeded. In the earlier part of the operation, the discharge water contained as much as 30 per cent of oil, but the quantity of oil diminished as pumping proceeded. During this latter period, the oil content of the discharge water exceeded 5 per cent. At all times, the analysis of the water discharged from the separator, even after the operation of No. 1 plant alone, showed it to be



FIRST BOTTLE SHOWS MIXTURE TAKEN FROM THE *LEVIATHAN*'S BALLAST TANKS, THE OTHERS SHOW CLEAR WATER TAKEN FROM EFFLUENTS AFTER SEPARATION

absolutely free from oil and the recovered oil contained only 6 per cent of water. In tests conducted on previous occasions, water coming out of No. 1 plant contained 0.002 per cent of oil, but after passing through the combination of No. 1 and No. 2 plants the water was found free from oil.

On Sept. 16, another demonstration was carried out at Portsmouth for the benefit of representatives of the admiralty, when the *J. TAYLOR PEDDIE* again dealt with various oily mixtures from the admiralty tanker *SLAVOL*, and the following results were obtained:

1—Water taken from No. 1 plant 20 minutes after commencement of test when emptying ballast tank No. 1, 0.00075 per cent oil;

2—Water from No. 1 plant during

change over from No. 1 to No. 2 ballast tank, 0.017 per cent oil;

3—Oil water mixture delivered from ballast tank No. 1, 4 per cent oil;

4—Oil water delivered from ballast tank No. 2, 1.44 per cent oil;

5—Water from No. 2 plant, as flowing into the harbor, free from oil.

This test lasted for six and a half hours, during which time 500 tons of separator water was estimated to have passed through the apparatus.

As stated above, the demonstrations were carried out with a plant fitted in a barge but the whole plant is designed for being installed in ships. The results of these tests are of great interest to shipowners since they show that ballast water can now be discharged into the sea free from oil and the oil recovered.

# Late Decisions in Maritime Law

## Legal Tips for Shipowners and Officers

Specially Compiled for Marine Review

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**U**NDER a charter obligating the charterers to pay the wages of officers and crew, and reserving to the owners power to appoint and remove the captain and chief engineer, the owners, it was held in the case of *ALLIANCE*, 290 *Federal Reporter* 450, rather than the charterers, were in control, and therefore, liable for damages caused by improper navigation by the captain, and it was immaterial that the collision from which the damage resulted occurred in waters for the navigation of which the master appointed by the owners had no pilot's license, and that the charterers had agreed that the chief officer, to be appointed by them, should possess the necessary pilot's license.

A bailee for hire under a charter party should not be made an insurer by implication, but only by clear and explicit language, and the terms of a charter requiring the return of the vessel in the same condition "as it is in now, less ordinary wear and tear," makes the bailee liable only for its own negligence.—*RAYMOND M. WHITE*, 290 *Federal Reporter* 454.

The measure of damages for a charterer's breach by refusing the vessel tendered is the amount of the freight money reserved in the charter less the expense incurred in earning it.—*Massari v. Forest Lumber Co.*, 290 *Federal Reporter* 470.

The master of a vessel and the agent of the charterer are without power to change the terms of a charter party made between the owner and charterer without specific authority.—*Oneida Navigation Co. v. Arkell & Douglas*, 290 *Federal Reporter* 827.

"A seaman is not allowed to recover an indemnity for the negligence of the master, or any member of the crew, but is entitled to maintenance and cure, whether the injuries were received by negligence or accident." \* \* \* Section 20 of the seamen's act of March 4, 1915 \* \* \*, which declares 'seamen having command shall not be held to be fellow-servants with those under their authority,' does not change the rule of the shipowner's liability to a member of the crew injured by reason of another member's negligence, without regard to their relationship imposed by the maritime law.—*Payne v. Jacksonville Forwarding Co.*, 290 *Federal Reporter* 936.

A general agent for a steamship company is not entitled to a maritime lien for advances and disbursements made generally on account of the ships of its principal in the due course of its business for which no express and specific

reservation of lien was made at the time. Such an agent, a corporation owned by the company, is not entitled to a maritime lien for advances made to vessels of the company, either under the general maritime law or the act of June 23, 1910, as amended by act of June 5, 1920.—*CENTAURUS*, 291 *Federal Reporter* 751.

A tug must watch changes in weather while a tow is moored, and must go to its assistance when the changes render such action necessary, and the tug is not to be excused because the severity of the storm drove other boats upon the shore.—*HACKENSACK*, 291 *Federal Reporter* 69.

The fact that leakage from a ballast tank drained into the bilges, and from there overflowed into the hold of a vessel, where it damaged the cargo, did not exonerate the ship from liability, under the Harter act, sec. 3, on the ground that the damage was caused by failure to keep the bilges pumped, which was a fault in navigation. *ASUARCA*, 291 *Federal Reporter* 73.

While a maritime lien for advances to discharge valid liens created in a home port may be sustained, yet it is essential that the existence and identity of the liens and the fact that the money was actually used for the purpose of discharging them be established by competent evidence.—*PRINCESS*, 291 *Federal Reporter* 89.

The effect of a provision of a charter party giving the owner a lien on sub-freights, it was said in the case of *MOUNT SHASTA*, 291 *Federal Reporter* 92, is to subrogate the owner to the remedies of the charterer in respect thereto, and the owner can not maintain a suit to recover freight money alleged to be due from a cargo owner, which neither the vessel nor the charterer could recover.

A watchman employed on a vessel under construction, and though launched, not completed, it was held in the case of *Pacific American Fisheries v. Hoof*, 291 *Federal Reporter* 306, is not a "seaman" within the rule that his recovery for injuries is limited to wages, maintenance, and cure. A vessel and her owner both by English and American law, it was further said, are liable to indemnity for injuries received by seamen in consequence of the ship's unseaworthiness or failure to supply and keep in order the proper appliances appurtenant to the ship.

Where a ship on a voyage was captured as a prize of war, and the voyage

was never completed, the seamen, who performed no service after the capture, were entitled to transportation to the port of shipment as destitute seamen, but were not entitled to wages after their service ceased.—*EDNA*, 291 *Federal Reporter* 379.

The leaving of his ship by a seaman before completion of the voyage, and when the ship was in danger, with intent not to return, and with failure to return, was held in the case of *LEVI W. OSTRANDER*, 291 *Federal Reporter* 908, to constitute desertion, and deposit by the master of the vessel with a consul of wages due a seaman after his desertion, or a willingness to have him return, was not a waiver of the desertion, where the seaman left wilfully, without intention of returning, and did not return.

Where the master of a vessel on the Great Lakes receives on board a cargo of grain loaded by the charterer, he is presumed to know that the charterer in due course will issue bills of lading, and the ship is bound to make right delivery in accordance with such bills of lading. By the prevailing custom at Buffalo, a ship bringing a cargo of grain is required to unload at the particular place designated in the bill of lading, or, if not so designated, at the place named by the consignee.—*G. A. TOMLINSON*, 293 *Federal Reporter* 51.

A shipowner has no lien on a cargo for demurrage, unless such a lien is given by the terms of the charter, and then only on the cargo loaded on the ship under the charter, in which the lien is reserved. When the charter from owner to libellant authorized a lien on the cargo for demurrage, but the charter from libellant to shipper contained no such provision, the owner had no lien on the cargo for demurrage and payment of demurrage by the shipper to the owner was not a forced payment, which the shipper was entitled to have credited on the freight charges due libellant.—*Southern Export Co. v. Bahamas-Cuban Co.*, 293 *Federal Reporter* 66.

A tug, valued at \$15,000 which towed to safety a steamship laden with crude and fuel oil and worth, with cargo, above \$317,000, from the bulkhead of an asphalt plant which was on fire, with tanks exploding and the wind blowing toward the steamer, was held, in the case of *MAGNETIC*, 293 *Federal Reporter* 94, entitled to a salvage award of \$5000, it appearing that the service was promptly and efficiently rendered in less than an hour, but without great danger to the tug.

(Continued from Page 470)

requirements for diesel engines of just as large power and applied to just as large ships as any firm in Europe. There is now no reason for lack of confidence on this score. The cost, unless ultimately worked out on a production basis cannot hope to compare favorably with European costs as the standard of wages and working conditions in the United States makes this

the same lines. It is clear enough that ultimately, economic forces alone will be effective in the promotion of any real growth in the expansion of the diesel fleet in the United States. But is it not possible that foreign steamship owners are at present showing great far-sightedness and initiative in anticipating future requirements by building diesel vessels? American steamship owners now fully aware of

sels and the substitution of diesel power for inefficient steam plants in otherwise modern ships is no longer greatly complicated by the question of continuous operation without risk of breakdown. Not only the owners but the insurance companies and the classification societies are now thoroughly convinced that the diesel engine, when constructed and installed under proper supervision by experienced engine builders and shipyards, is suitable and dependable as power for vessels of all types when operated by competent engineers. The advantages of the internal combustion engine and electrification of auxiliaries over the steam plant have become by constant reiteration, familiar to the marine field. These advantages may be listed as follows:

1. Fuel consumption from  $\frac{1}{4}$  to  $\frac{1}{3}$  that for steam,
2. Deadweight carrying capacity increased for same steaming radius.
3. Engine room crew is reduced,
4. No upkeep on boilers, steam piping and fittings,
5. Full power at will of operator at all times and practically at once,
6. Saving in cubic due to elimination of deep tank and in space in way of boiler uptakes.
7. No danger of freezing of steam line and deck machinery nor stand-by losses.

Of all the above reasons, the saving in fuel is the most important. This saving is well established and is direct and definite and represents on the average 18 to 21 per cent reduction from the total operating costs of an equivalent steamship.

In long voyages for deadweight cargoes as distinguished from cubic cargoes, the diesel ship has a very marked advantage over the steamship, due to the fact of course that cargo weight can be carried in place of fuel weight. There is also an additional gain in useful deadweight because cargo weight can be carried in place of make up boiler feed water weight.

In a service between New York and eastern Mediterranean ports, an analysis comparing a 7815 deadweight tons steam vessel of an average operating speed of about 10 knots with a diesel vessel of 125 tons less deadweight and of the same speed shows that the diesel vessel can carry in four voyages (approximately one year's operation) as much cargo by weight as the steamship can carry in  $5\frac{1}{4}$  voyages of approximately one year and  $4\frac{1}{2}$  months operation. Any shipowner or operator will appreciate the tremendous advantage which this gives the diesel vessel in increased revenues where the av-

Table II

**DIESEL VESSELS OF THE UNITED STATES TABULATED IN ORDER OF GROSS TONNAGE**

Showing Preponderance of Smaller Sizes and Large Number of Wooden Hulls as of Oct. 1, 1924

Limits of Gross Tonnage	No.	Type	Hull
500-1000	5	Freighter	Wood
	1	Freighter	Steel
	10	Tanker	Steel
1000-1500	2	Freighter	Wood
	1	Freighter	Steel
	13	Tanker	Steel
1500-2000	6	Freighter	Wood
	8	Freighter	Steel
	2	Tanker	Steel
2000-2500	8	Freighter	Wood
	6	Freighter	Steel
2500-3000	1	Freighter	Wood
	1	Freighter	Wood
	1	Tanker	Wood
3000-4000	3	Freighter	Steel
	5	Tanker	Steel
	1	Freighter	Steel
4000-5000	1	Freighter	Steel
6000-7000	1	Freighter	Steel
7000-8000	4	Freighter	Steel
	2	Tanker	Steel

NOTE: Total Number of Diesel Vessels in Above Table—81 They May Be Grouped as Follows:

Direct Connected			
23	Freighters	Wood	Hull
1	Tanker	Wood	Hull
24	Freighters	Steel	Hull
29	Tankers	Steel	Hull
Totals 77			
Diesel Electric			
1	Freighter	Steel	Hull
3	Tankers	Steel	Hull
4			

impossible. However, the government should, and can do so, without money out of pocket, sell government steam vessels at even less than the nominal price now allowed, to private owners for conversion so that the sum total for a modern up-to-date vessel converted to diesel drive and electric auxiliaries will compare favorably with new construction abroad.

It is only logical to suppose that the present activity of the government in going ahead with the first 18 vessels to be converted will have a stimulating effect on private owners along

the vital importance of the diesel in economical operation and after giving deep thought and study to this subject, to protect their own future welfare, ought to adopt at once a wise program of construction and conversion to meet the inevitable competition to come. At any rate they ought to plan thoroughly now for such construction.

The majority of experienced and fully informed steamship owners and operators are now undoubtedly convinced of the dependability of the diesel engine. Hence, the problem of choice of power for proposed new ves-

erage density of the cargo is such that the vessel can be loaded down to her marks and the weight of additional fuel and water which the steamship must carry can be carried as cargo.

The diesel ship will, of course, have a much greater steaming radius and it is possible to make a voyage of much greater distance without refueling. This advantage is of the greatest importance as in certain routes it may be impossible to obtain fuel or the fuel offered may be poor in quality and high in price. The additional cubic in a diesel ship as compared with a steamship is small as a rule but it does represent additional earning capacity. In

bale cubic in the diesel and steamships, otherwise identical, referred to above, there is an additional bale cubic in the former of 8990 cubic feet or on the basis of 40 cubic feet to the ton 224.7 tons. Now a diesel vessel of this type making four voyages a year could carry nearly 1800 tons more cargo than the steam vessel during the year. At the rate of \$20 a ton, this would mean a possible additional revenue of \$36,000 a year. Naturally, business does not work out quite as neatly as this in practice but the fact remains that the potential earning capacity is there.

The elimination of boilers and piping

and their upkeep is also an important item of saving in the diesel ship. Electrification of auxiliaries reduces their fuel operating costs. This reduction is so great that it is hard to believe, but fuel consumption has been conservatively estimated at 1/11 to 1/10 of that for steam auxiliaries. From actual operating results of the two vessels compared above, the fuel consumption in port for the diesel ship was 0.69 tons per day while for the steamship it was 8.6 tons or over, 12 times as much. Full power is available at once with electric auxiliaries. Another consideration is freedom from any risk of freezing.

## Ocean Freight Rates

Per 100 Pounds Unless Otherwise Stated

Quotations Corrected to Nov. 22, 1924, on Future Loadings

NOTE: FREIGHT RATES STEADY WITH SOME DECREASE FOR GRAIN

New York to	Grain	Provisions	Cotton (H. D.)	Flour	General cargo cu. ft.	100 lbs.	Finished steel	REMARKS Freight Offered	From North Pacific Ports to	Lumber Per m. ft.
Liverpool....	3s 0d	\$0.50	\$0.35	\$0.21	\$0.40	\$0.75	\$7.00T	Eased Off	San Francisco.....	\$5 00
London.....	3s 0d	0.50	0.30	0.22	0.40	0.75	7.00T	Eased Off	South California.....	5 00 to 6 00
Christiania....	\$0.22	0.45	0.50	0.27	0.42½	0.85	8.00T	Very Good	Hawaiian Islands.....	9 00 to 10.50
Copenhagen....	0.22	0.45	0.40	0.26	0.42½	0.85	8.00T	Very Good	New Zealand.....	11 00 to 13.00
Hamburg.....	0.15	0.35	0.35	0.24	0.37½	0.75	8.00T	Fair	Sydney.....	10 25 to 12 50
Bremen.....	0.17	0.35	0.45	0.25	0.37½	0.75	8.00T	Very Good	Melbourne-Adelaide....	10.50 to 13.00
Rotterdam and Amsterdam.	0.16	0.32½	0.40	0.24	0.35	0.70	7.50T	Good	Oriental Ports.....	7.00 to 9.00
Antwerp.....	0.12	0.32½	0.35	0.22	0.35	0.70	7.00T	Slow	Oriental Ports (logs)....	10 00 to 11 00
Havre.....	0.18 to 0.19	0.50	0.35	0.27½	0.40	0.75	8.00T	Improved	Peru-Chile.....	12 00 to 14.00
Bordeaux.....	0.18 to 0.19	0.50	0.35	0.27½	0.40	0.75	8.00T	Improved	South Africa.....	17.50 to 19.00
Barcelona.....	0.20 to 0.25	12.00T	0.30	10.00T	—12.00T—	—	10.00T	Fair	Cuba.....	11 00 to 12.00
Lisbon.....	0.20	0.65	0.40	7.00T	—20.00T—	—	7.00T	Fair	United Kingdom.....	80s to 90s
Marseilles....	0.18	0.55	0.50	5.60T	—20.00T—	—	5.00T	Very Slow	United Kingdom (ties)...	70s to 80s
Genoa.....	0.16	0.50	0.40	8.00T	—17.00T—	—	10.00T	Fair	Baltimore-Boston range.	\$11.00 to 12 50
Naples.....	0.16	0.50	0.40	8.00T	—17.00T—	—	10.00T	Fair	Baltimore-Boston range (ties).....	Not quoted
Constantinople	0.27½	17.00T	0.75	0.32½	—20.00T—	—	9.00T	Fair	Buenos Aires.....	14.00
Alexandria....	None	17.00T	0.75	0.32½	—20.00T—	—	9.00T	Good	Flour and Wheat	
Algiers.....	0.22	0.75	0.75	0.40	—20.00T—	—	7.00T	Very Slow	Japan (net ton).....	\$ 3.75 to 4.00
Dakar.....	14.50T	.....	12.00T	—20.00T—	—	—	10.00T	Good	U. K. and Continent (gross ton).....	37s 6d to 40s
Capetown.....	12.00T	12.00T	.....	10.00T	—12.00T—	—	9.00T	Good		
Buenos Aires....	18.00 to 20.00T	.....	.....	.....	18.00 to 20.00T	8.00 to 8.80T	8.00T	Good		
Rio de Janeiro....	19.00 to 21.00T	.....	7.00 to 7.70T	19.00 to 21.00T	6.00 to 6.60T	6.00T	8.60T	Good		
Pernambuco.....	22.00T	.....	9.00T	—22.00T—	—	—	8.60T	Fair		
Havana.....	0.22½ to 0.27½*	0.42½*	.....	0.22½*	0.54*	1.08*	0.20*	Good		
Vera Cruz.....	0.25	0.40	0.45	0.25	0.52½	1.05	0.30 to 0.35	Improved		
Valparaiso.....	1.07	.....	0.70	0.45	0.80	10.00T	10.00T	Fair		
San Francisco....	0.40 to 0.70	.....	0.50 to 1.10	.....	2.50	0.55 to 1.00	1.00T	Good		
Sydney.....	18.00T	2.50	18.00T	18.00-24.00T	9.00-12.00T	1.00T	10.00T	Fair		
Calcutta.....	16.00T	0.60	12.00T	—16.00T—	—	—	10.00T	Improved		

T—Ton. ‡Per quarter of 480 lbs. †Landed. ††Heavy products limited in length. \*Extra charge for wharfage.

### Principal Rates To and From United Kingdom

Grain, River Plate to United Kingdom.....	23 6	Pig iron, United Kingdom to New York	15 0
Coal, South Wales to Near East.....	12 0	or Philadelphia.....	7 0
Coal, United Kingdom to Buenos Aires.....	13 0	Iron ore, Bilbao to Glasgow.....	10 6
Manganese Ore, Poti to Philadelphia.....	\$4.00	Iron ore, Huelva to Phila. or Balto....	

### Bunker Prices

At New York				At Philadelphia			
Coal alongside per ton	Fuel oil alongside per barrel	Diesel oil alongside per gallon		Coal triad. in bunk. per ton	Fuel oil alongside per barrel	Diesel oil alongside per gallon	
Jan. 9, 1924.....	\$5.25@6.50	\$1.41½	4.61@5.42c	Jan. 9, 1924.....	\$5.50@6.30	\$1.415	3.86c
April 8.....	4.50@6.50	1.66½	5.51c	April 8.....	4.85@5.85	1.955	5.41@5.65c
July 21.....	4.50@6.25	1.81½	5.16@5.65c	July 21.....	4.85@6.00	1.945	5.40
Oct. 21.....	5.00@6.05	1.81½	4.91@5.16c	Oct. 21.....	5.00@5.80	1.815	4.90c
Nov. 22.....	5.00@6.05	1.81½	4.91@5.50c	Nov. 22.....	5.00@5.80	1.815@1.83	4.90@5.14c

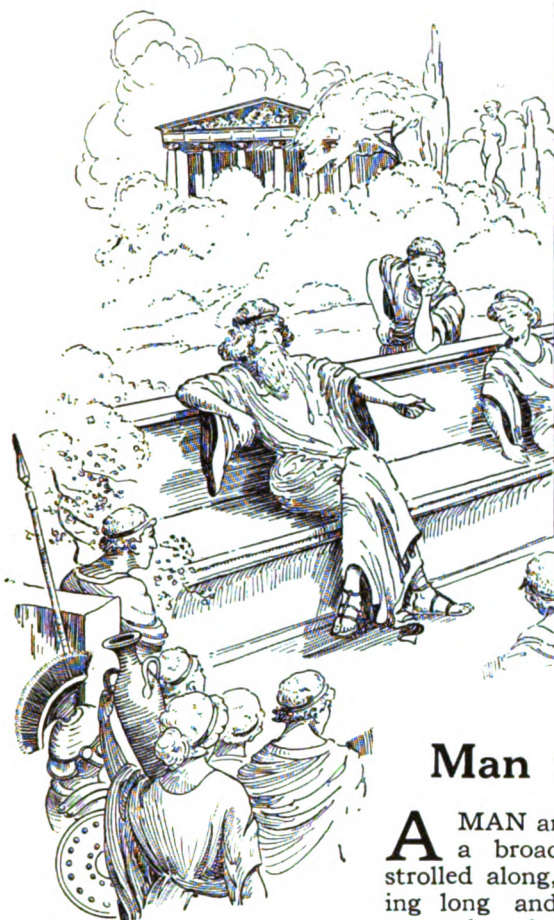
### Other Ports

Boston coal, per ton	\$6.62
Boston, oil, f. a. s.	
per barrel	\$1 50
Hampton Roads, coal,	
per ton f.o.b.	4.35@4.75
Cardiff, coal, per ton	15s 6d
London, coal, per ton	25s 0d
Antwerp, coal, per ton	25s 6d

# Late Flashes On Marine Disasters

Brief Summaries of Recent Maritime Casualties—  
A Record of Collisions, Wrecks, Fires and Losses

NAME	DATE	NATURE	PLACE	DAMAGE RESULTING	NAME	DATE	NATURE	PLACE	DAMAGE RESULTING
Alcaeus Hooper	Oct. 14	Abandoned	Boston	Sank	Kershaw	Oct. 13	Aground	Smith's Point	Floated
A. F. Coats	Oct. 25	Disabled	Belize	Sails lost	Kansas	Oct. 27	Fire	Manistee, Mich.	Total loss
A. S. Upson	Oct. 27	Aground, fog	Stag Island	Floated	Katuna	Oct. 21	Disabled	Buenos Aires	To rudder
Admiral Hastings	Oct. 13	Ashore	Heligoland	Leaking					
Aboukir	Oct. 13	Collision	Hamburg	Badly	Luossa	Oct. 26	Aground	London	Floated
Aquarius	Oct. 29	Disabled	Cuxhaven	Machinery	Latvija	Oct. 8	Aground	Riga	Floated
Alden Anderson	Oct. 29	Fire	San Francisco	Heavy	L. B. Miller	Oct. 29	Collision	Lake Huron	Badly
Acme	Oct. 31	Ashore	Bandon	Total loss	Laura	Oct. 28	Fire	Trieste	Badly
Ariette	Oct. 20	Disabled	Tunis	Leaking	Llanelly	Oct. 6	Aground	Swash	Not stated
Astori Mendi	Oct. 20	Collision	Rotterdam	Not stated	Loughborough	Oct. 20	Aground	Rosario	Floated
Athena	Oct. 22	Disabled	Great Yarmouth	Deck cargo lost					
Anna C. Minch	Nov. 1	Struck shed	Lake Superior	Bow dam.	Marie J. Thompson	Oct. 14	Aground	Key West	Floated
Anna	Oct. 31	Fire	Norfolk	Not stated	Mineola	Oct. 14	Aground	Boca Debalao	Floated
					M. C. Holm	Oct. 23	Aground	Cuban waters	Floated
B. H. Taylor	Oct. 18	Disabled	Gary	Lost boom	Michael Tracy	Oct. 24	Collision	Virginia Capes	Not stated
Birmingham City	Oct. 17	Aground	Columbia River	Floated	Matadi	Oct. 13	Fire	Matadi	Not stated
B. F. Jones	Oct. 26	Collision	Detroit River	Heavy	Monte Doro	Oct. 13	Disabled	St. Brieux	Damaged
Boston Maru	Oct. 26	Collision	St. Helens	Stern badly	Minnequa	Oct. 14	Fire	Falmouth	Slight
Brynild	Oct. 14	Ashore	Malmö	Floated	Manatee	Oct. 27	Aground	Cape Anna	Floated
Bencleuoh	Oct. 16	Heavy sea	Panama	Broke steer gear	Marienberg	Oct. 1	Stranded	Tankar	Not stated
					Mary	Oct. 9	Collision	Copenhagen	To bridge
Briarpark	Oct. 9	Ashore	Cardiff	Floated	Matador	Oct. 10	Abandoned	Stonehaven	Sinking
Berengaria	Nov. 1	Disabled	Southampton	Prop. brk.	Mauritanie	Oct. 16	Stranded	Djidjelli	Leaking
Boheme	Oct. 20	Collision	Rotterdam	To bow	Millaia	Oct. 23	Collision	Slight	Slight
Boukadra	Oct. 21	Aground	West Marsh Whf.	Not stated	Muriel Winters	Nov. 1	Ashore	Gulphort	Leaking
Belgenland	Oct. 21	Touched grd.	Valkenisse Chan.	Not stated	M. Turner	Nov. 4	Heavy sea	Progreso	Leaking
Brownie	Oct. 22	Bad weather	Marseilles	Badly					
Baltannic	Oct. 23	Struck pierhd.	Libau	To stem	Nazareno	Oct. 29	Fire	Brooklyn	Slight
Birkenhead	Nov. 3	Ashore	Philadelphia	Floated	Nievre	Oct. 6	Ashore	Tunis	Floated
					Noreg	Oct. 9	Disabled	Bergen	To rudder
Cuyler Adams	Oct. 13	Collision	Lorain	To side					
City of Dallas	Oct. 16	Aground	Jersey Shore	Floated	O'Brien Sisters	Oct. 18	Grounded	Long Island Sound	Floated
City of Lincoln	Oct. 21	Disabled	Fremantle	Blade brk.	Lieum	Oct. 6	Disabled	San Francisco	Badly
Carrabulle	Oct. 21	Ashore	Fort Morgan	Floated	Ouse	Oct. 17	Stranded	Hinderbollen	Not stated
Ceuta	Oct. 13	Disabled	London	To prop.					
Calcite	Oct. 30	Ashore	Detour	Leak, float.	Pontiac	Oct. 24	Collision	Detroit River	Damaged
Carsholm	Oct. 9	Heavy sea	Portland	Lost part deckload	Pleasure	Oct. 24	Collision	Detroit River	Not stated
					Pacific	Oct. 13	Collision	Shanghai	Slightly
Caprera	Oct. 16	Fire	Tripoli	Total loss	Pemba	Oct. 14	Collision	Sandanh Bay	Badly
Carignano	Oct. 17	Disabled	Colombo	Prop. blade	Peshawur	Oct. 13	Collision	Shanghai	Slightly
Capeia	Nov. 1	Ashore	Brunsduttelkoog	Floated	Pelican	Oct. 16	Ashore	Burry Holme	Floated
					Port Nicholson	Oct. 23	Str. Rock	Las Palmas	Badly
Domira	Oct. 14	Collision	Rotterdam	Leaking	Phoebe	Oct. 18	Ashore	Blankenese	Floated
D. A. Springstead	Oct. 25	Struck rock	Port Richmond	Sank					
Dunscore	Oct. 14	Ashore	Fidra Island	Floated	Roanoke	Oct. 18	Ashore	Sand Key	Floated
Dagmar	Oct. 15	Collision	Elbe	Bows, badly	Ryuh Maru	Oct. 23	Hit bottom	Portland	Leaking
Douglas H. Thomas	Oct. 9	Not stated	Ingonish	Sank	Rebecca C. Scott	Oct. 22	Tornado	Cienfuegos	Slight
Dolly Madison	Oct. 9	Ashore	Antilla	Total wreck	Rike	Oct. 26	Ashore	Cove Point	Floated
Dromaine	Oct. 16	Disabled	Belfast	Badly	Resolute	Oct. 14	Ashore	Brunsduttelkoog	Floated
Else	Oct. 12	Ashore	Pensacola	Floated	Senator Derbyshire	Oct. 15	Fire	E. of Point Petre	Total loss
Eastern Knight	Oct. 16	Aground	Columbia River	Floated	Skagway	Oct. 25	Ashore	San Francisco	Floated
E. A. S. Clarke	Oct. 26	Collision	Detroit River	Sank	San Giuseppe	Oct. 24	Collision	San Francisco	To bow
Evelyn Manor	Oct. 13	Collision	Rouen	To bridge	Silvia	Oct. 25	Aground	Virginia Capes	Floated
Evening Star	Oct. 17	Aground	Inchkeith	Badly	Sabina	Oct. 13	Collision	Hell Gate	Slight
Ettingham B. Morris	Oct. 9	Struck	Soo River	7 plates	Saga	Oct. 13	Collision	Bilbao	Slight
Ester	Oct. 23	Aground	Topla	Floated	San Carlos	Oct. 13	Collision	Bilbao	Slight
Elswick Tower	Nov. 10	Disabled	Londonderry	Machinery	Store Nordiske	Oct. 13	Collision	Shanghai	Slight
					Scoresby	Oct. 27	On rocks	Egg Harbor	To bottom
Firmore	Oct. 28	Ashore	Fortune Island	Not stated	Skogland	Oct. 29	Ashore	Frontera	Floated
Fontana	Oct. 29	Collision	Detroit River	Not stated	Salvatrice	Oct. 28	Disabled	Halifax	Leaking
Fernside	Oct. 16	Aground	River Tees	Floated	Shikotan Maru	Oct. 15	Ashore	Kobe	Rudder brk.
Flackwell	Oct. 16	Aground	London	Not stated	Sundsvall	Oct. 15	Collision	Lower Elbe	To plating
Frank E. Taplin	Oct. 28	Struck	Green Bay	12 plates	Stream Fisher	Oct. 7	Disabled	Great Yarmouth	Lost dk. ld.
Frumiz	Oct. 6	Disabled	Balvica	Not stated	Shibaura Maru	Oct. 6	Ashore	Tokio	Floated
Fellowcraft	Oct. 6	Sprang leak	Chicago	Sunk	Snyg	Oct. 6	On rocks	Asenoeen	Not stated
Facto	Oct. 7	Touched grd.	Bergen	Leaking					
					Thelma	Oct. 24	Disabled	Havana	Lost dk. ld.
Gov. John Lind	Oct. 23	Aground	Old Bahana Chan.	Not stated	Tuskar Light	Oct. 14	Hit wall	Barry	Slight
Glencassie	Oct. 29	Ashore	West Nerbish Ch.	Floated	Tansy Bitters	Oct. 28	Fire	Tarpaulin Cove	Total loss
Glenorchy	Oct. 29	Collision	Lake Huron	Sk. total loss	Trecarrell	Oct. 6	Fire	Aden	Floated
Glentara	Oct. 9	Collision	Copenhagen	Not stated	Thomas Maytham	Oct. 6	Hit bridge	Chicago	Dekh. car.
Glenlyon	Nov. 3	Ashore	Isle Royale	Heavy					
G. A. Tomlinson	Nov. 3	Ashore	Grosse Point	Floated	Toyokawa Maru	Oct. 7	Not stated	Saghalien	Wrecked
George G. Crawford	Nov. 3	Ashore	Russell Island	Floated	Ternan	Oct. 7	Ashore	Malmö	Floated
Greenbatt	Oct. 21	Collision	Hamburg	To plates	Thorpe Grange	Oct. 17	Grounded	Antwerp	Floated
Guernsey	Oct. 23	Aground	West Nayland rock	Not stated	Turrett Crown	Nov. 2	Ashore	Meldrum Point	Not stated
Glenmoor	Oct. 23	Aground	Kotka Harbour	Leaking					
Glenrig	Nov. 7	Hit Dock	Ashtabula	Slight	Ullia	Oct. 27	Ashore	Garden Key	Not stated
					Ulysses	Oct. 9	Fire	Hamburg	Slight
Herakles	Oct. 9	Disabled	Jacksonville	To propeller	Utacarbon	Oct. 19	Collision	Bush Point	Not stated
Houston	Oct. 15	Not stated	Houston Channel	Sank					
H. W. Smith	Oct. 27	Disabled	Buffalo	To rudder	Vitruvia	Oct. 15	Disabled	Falmouth	To steerer
Hakuyo Maru	Oct. 13	Fire	Miho Paseka Bay	Total loss	Vanlear	Oct. 20	Fire	Nuevitas	Destroyed
Hauk	Oct. 13	Disabled	Christiana	To rudder	Valdarno	Oct. 25	Fire	St. Andrews Bay	Total loss
H. Dahlke	Oct. 29	Collision	Detroit River	Suc. pipes	Vesta	Oct. 15	Disabled	Holtenau	To plating
					Ville De Nice	Oct. 2	Ashore	Constantinople	Floated
Irmgard	Oct. 7	Collision	Holtenau	Badly					
Ironclad	Oct. 7	Collision	Plymouth	Badly	Walter A. Luckenbach	Oct. 25	Aground	San Francisco	Floated
I. L. Ellwood	Nov. 2	Collision	Lorain	Slight	W. H. Donner	Oct. 24	Collision	Chicago River	Undamaged
Irene	Oct. 20	Ashore	Key West	Floated	West Keats	Oct. 26	Collision	St. Helens	Hole in bow
					Wallingford	Oct. 13	Stranded	Columbia River	Badly
Jennie R. Foote	Oct. 13	Fire	Smith's Point	Not stated	Waki Maru	Oct. 14	Not stated	Shiriyu	Sunk
Jane	Oct. 7	Collision	Oland	Undamaged	W. M. Burton	Oct. 29	Ashore	Havana	Floated
Jupiter	Oct. 7	Collision	Oland	Damaged	West Jappa	Oct. 30	Collision	Santos	Not stated
J. S. Manuel	Nov. 2	Collision	Lorain	To plates	Waaldijk	Oct. 15	Hit quay	Buenos Aires	Not stated
Jamaica	Oct. 31	Fire	London	Total loss	Warwick	Oct. 10	Collision	Galleons Roads	Sank
Johanna	Oct. 21	Aground	Malmö	Floated	W. L. Smith	Oct. 2	Aground	Long Tail Point	Floated
Julius Holmblad	Nov. 7	Aground	Soo	Floated					
					Ysfidijk	Oct. 22	Water in hold	Havana	Leaking
					Ythan	Oct. 15	Sprang leak	Dunabrattn	Sank



*Twenty-five hundred years ago Father Aesop spun this yarn before all the wise men of ancient Greece. As handed down to us we know it as*

### *The Fable of the*

## Man who Boasted at the Wrong Time

**A** MAN and a lion were traveling a broad highway. As they strolled along, the man fell to boasting long and loudly of his great strength and prowess—of his mastery of all the universe.

At length the pair passed a marble statue representing, "A Lion Strangled by a Man". The man pointed to it and cried boastfully:

"See there—how strong Man is! Even the King of Beasts is as putty in his hands!"

"That statue was made by Man," replied the lion calmly. "We lions know

little of the art sculpture. But, to disprove your claim, I shall show you how we would have erected yon statue."

And, as it was long past dinner time anyway, he seized the man between his paws and straightway proceeded to make a buffet luncheon of him!

Too late the unhappy fellow saw the force of the lion's argument. For, as he looked at the flashing teeth above, he cried out miserably: "ALAS, HOW MUCH DEPENDS ON THE POINT OF VIEW!"

### *Long experience has given us both points of view*

We know lubricants from both sides—the refinery and the engine room as well.

*Long experience* in refining—nearly half a century of it—has made possible the Tide Water Power Group, lubricating oils and greases especially developed to meet the varied and severe requirements of all classes of machinery.

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*Long experience* of the Tide Water Staff of Lubricating Engineers, in the application of lubricants to ship machinery, assures a prompt, accurate solution of your most difficult lubrication problems.

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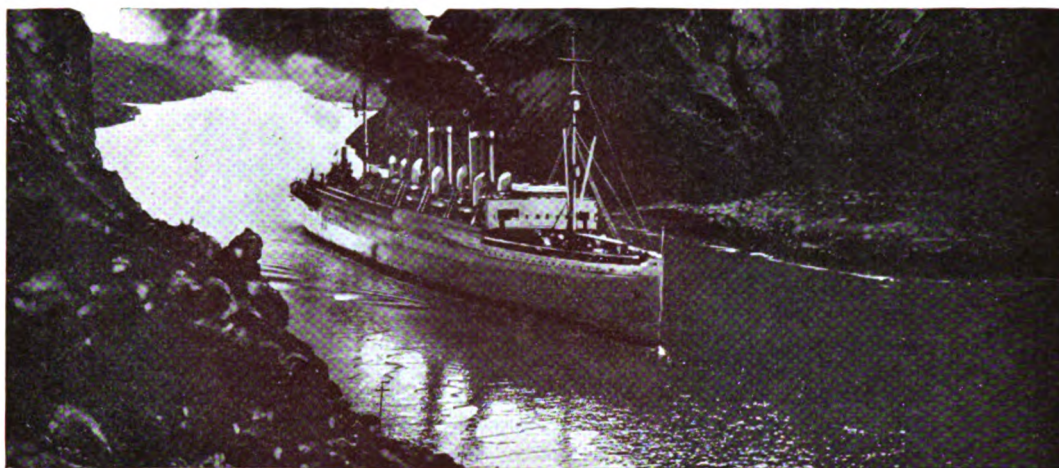
**TIDE WATER LUBRICANTS**

**TIDE WATER OIL SALES CORPORATION**  
11 BROADWAY, NEW YORK

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## Panama Canal

No matter what ports your ships may touch, you can contract in advance for deliveries of Gargoyle Marine Oils.



# How to wipe out initial costs

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- fewer over-haulings of engines in port.

Add these results together and you will find Gargoyle Marine Oils the most economical lubricants you can purchase. So economical are they that the world's shipping uses more of them than any other single brand.

Gargoyle Marine Oils scientifically correct for every type of marine engine may be had in any port of the world. See column at right.



**Marine Oils**  
A grade for each type of service

### What the

## Gargoyle Marine Oil Agreement

means to Ship Owners  
all over the World

Through its "memorandum of agreement," the Vacuum Oil Company offers you an economical and effective plan for the correct lubrication of your fleet as a unit.

**First Step:** Our representatives confer with you on the lubrication needs of your individual ships. The oils which we recommend will be scientifically correct for each engine and machine.

**Second Step:** We prepare an agreement with you, under which we will contract to deliver the required oil when and where wanted—at any port, at any date.

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Our representative  
will be glad to give you  
further details.

**VACUUM OIL COMPANY**

Specialists in the manufacture of  
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Obtainable everywhere in the world.

**NEW YORK, U.S.A.**

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# Marine Review

THE NATIONAL PUBLICATION COVERING THE BUSINESS OF  
TRANSPORTATION BY WATER

NEW YORK—CLEVELAND—LONDON

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## WHAT READERS WILL FIND

In any line of business, experience has shown the value of taking an inventory—pausing for breath to find out where you are, what you have done and where you are going. This issue, in one sense, does that function for two important industries serving the marine field. The growth in use of the diesel engine is familiar, but not many are thoroughly informed on the various types of diesel engines now built by American plants. In the same way, electricity has steadily grown into favor for marine service until now few realize its innumerable applications. You will find in this issue, just the facts you want to know about American types of diesel engines. You will find that experts have studied the diesel and electrical developments and spread them before your eyes in a most interesting manner.

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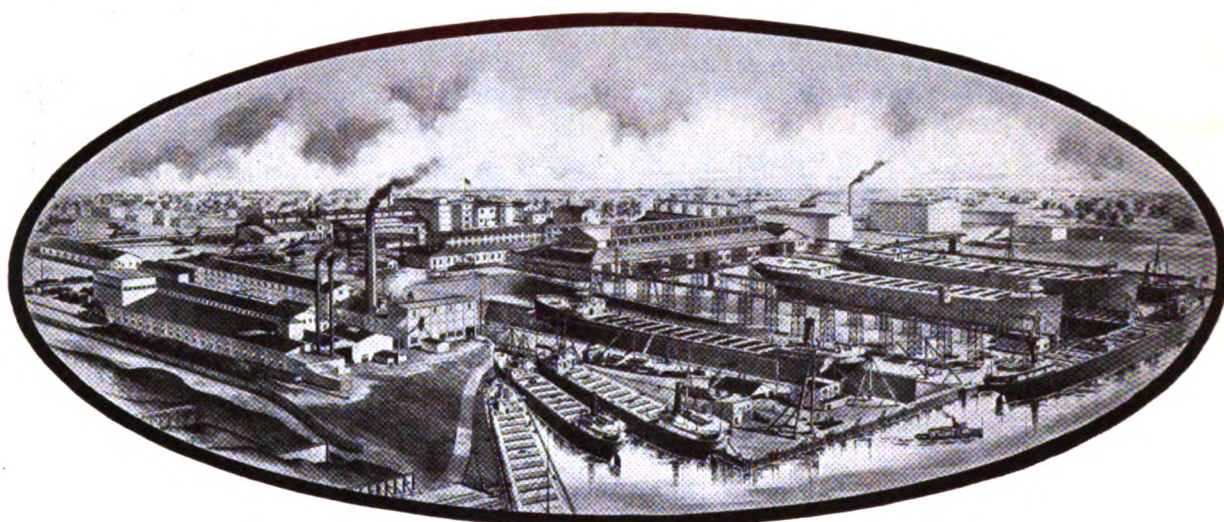
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TOLEDO - - - OHIO



Builders and Repairers  
*of*  
Ships and Engines

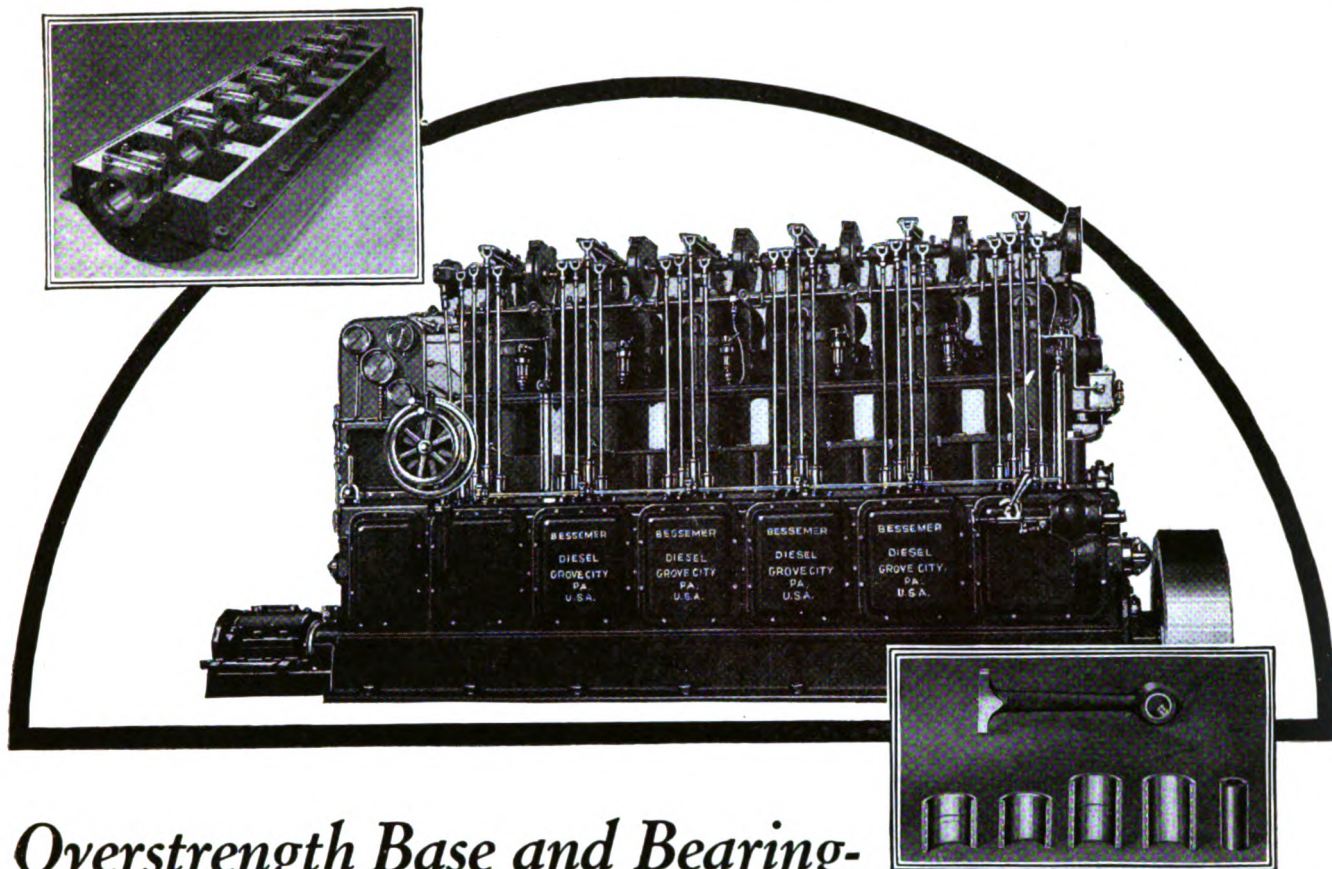
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## DIESEL ENGINES

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are assured of Service by our engineers  
in the principal ports of the world*

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Todd Mechanical Atomizing  
Fuel Oil Burner

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All of this furniture was manufactured in our well equipped plant:  
We will be pleased to estimate on your work whether it be one  
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**DISSOLVED ACETYLENE**

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## The Easiest Way

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**I**T HAS now been several years since our discovery of a practical method of cutting cast iron by the oxy-acetylene flame. This method was first discovered in the field. It was then perfected in the Oxweld laboratories, and since has been demonstrated and taught by Oxweld fieldmen to thousands of our customers' operators all over the country.

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## OXWELD ACETYLENE COMPANY

Chicago  
3642 Jasper Place

Long Island City, N.Y.  
Thompson Ave. & Orton St.

San Francisco  
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# Oxweld

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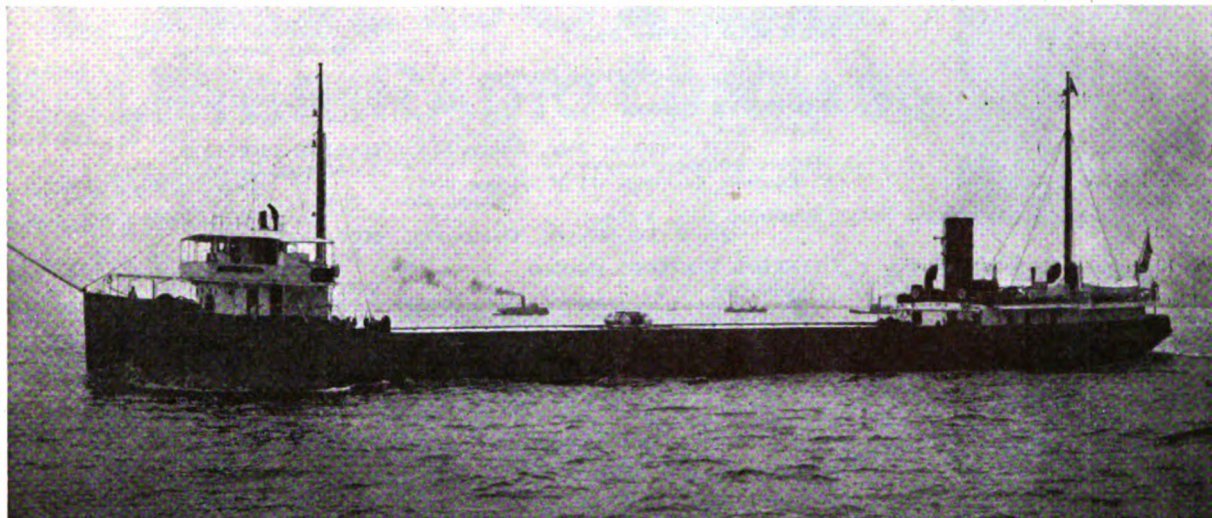
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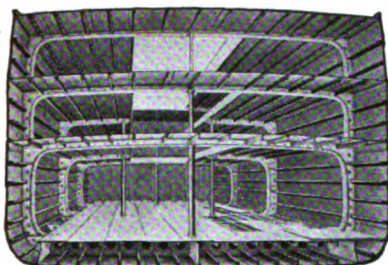
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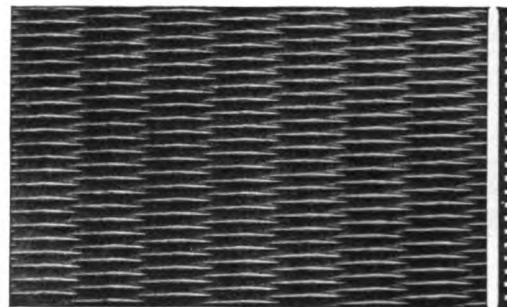
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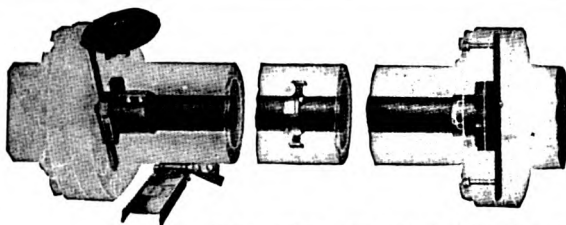
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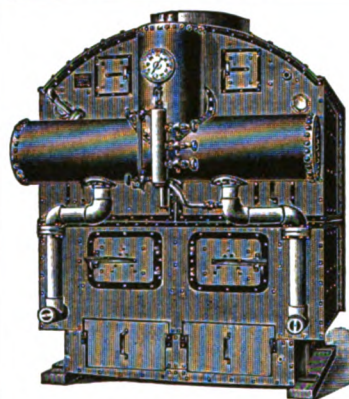
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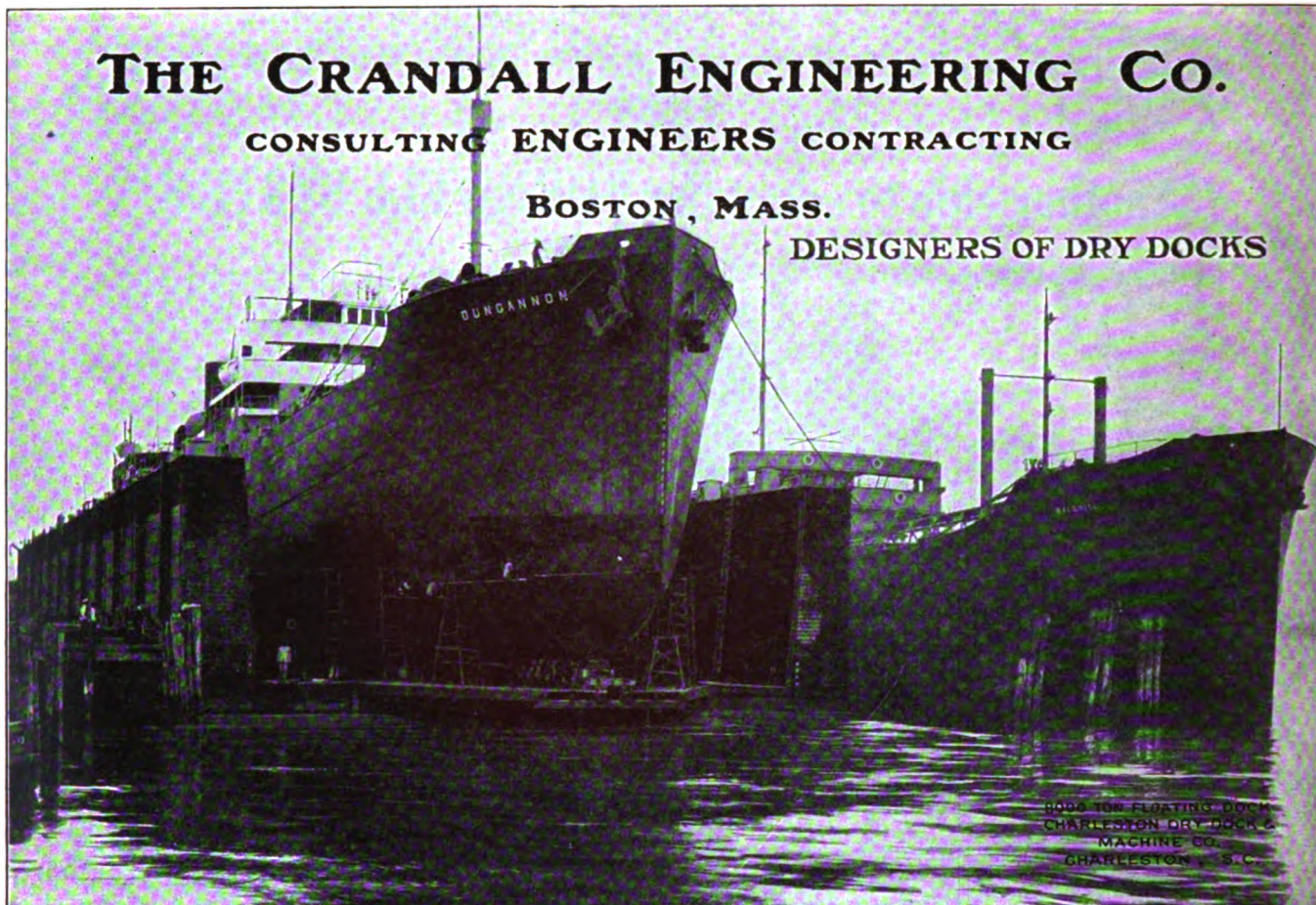
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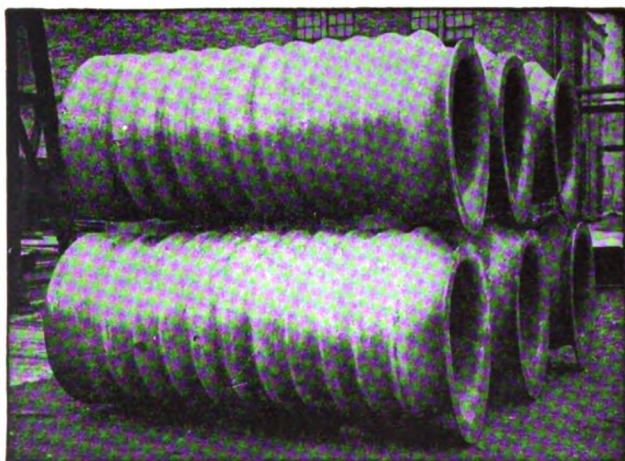
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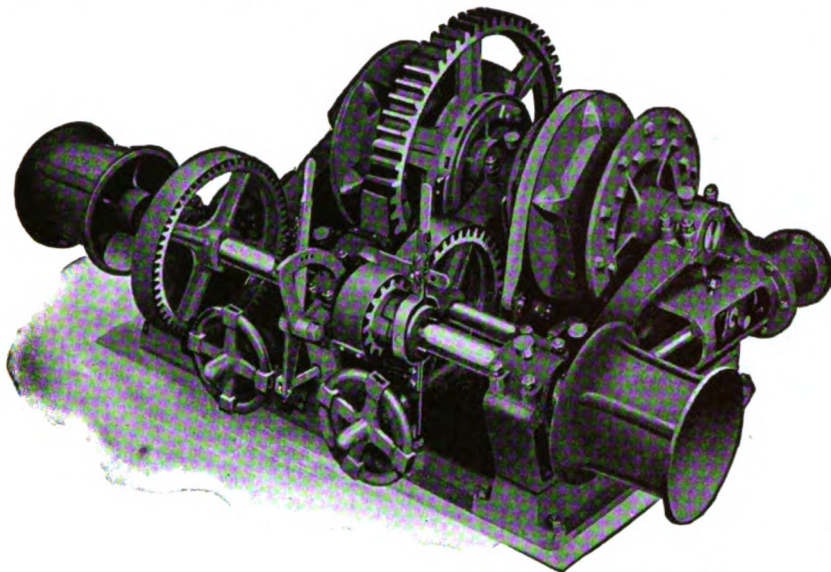
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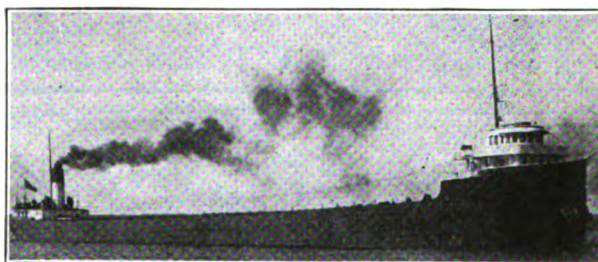
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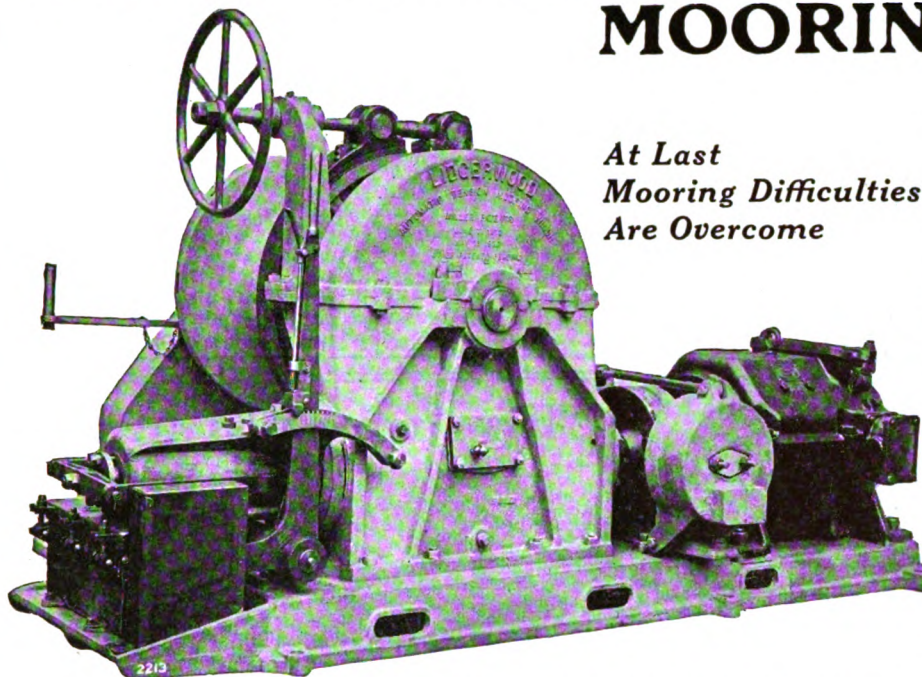
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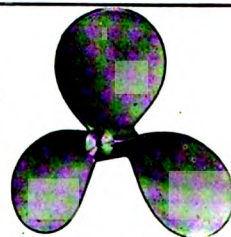
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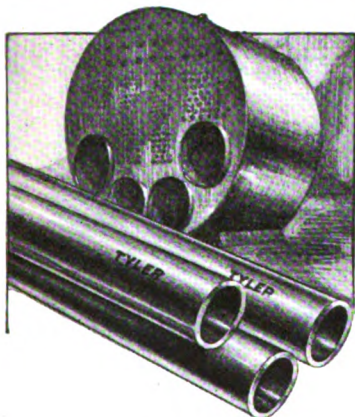


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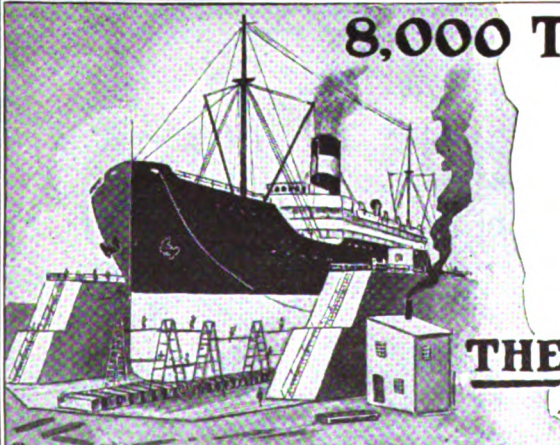
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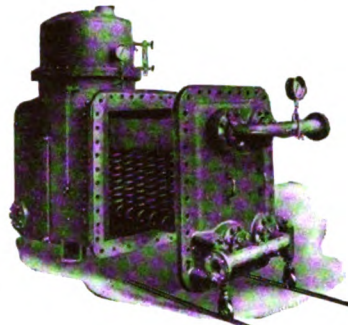
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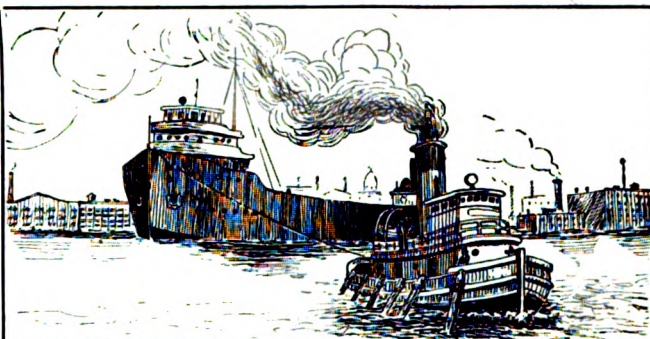
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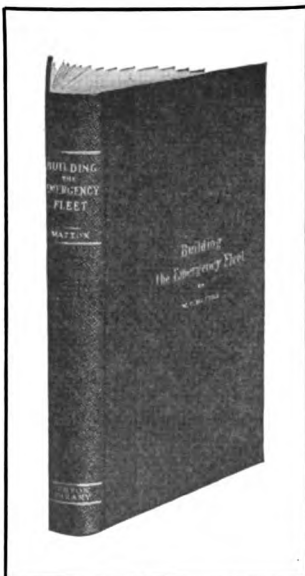
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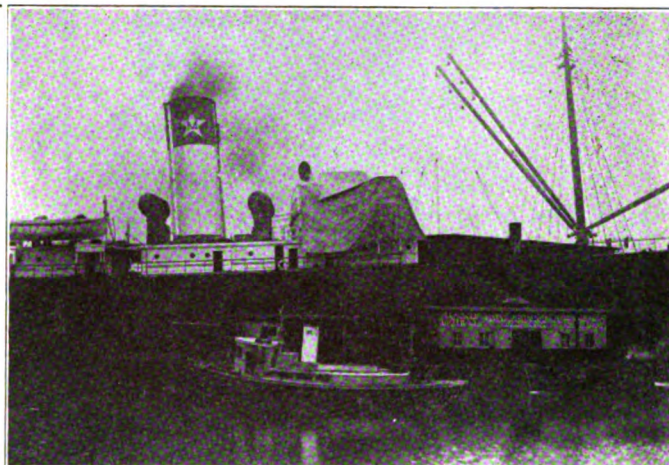
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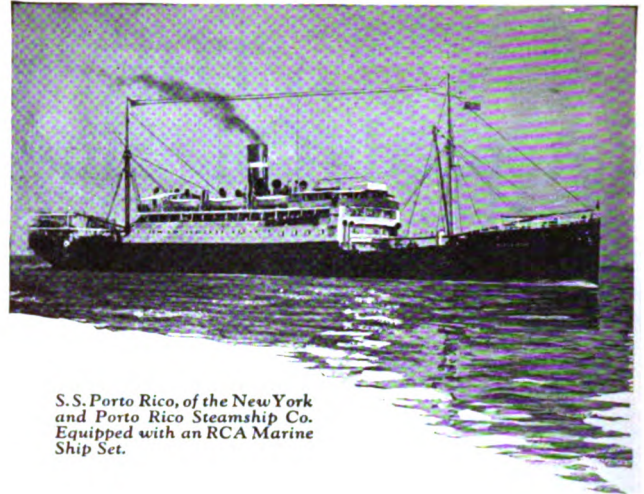
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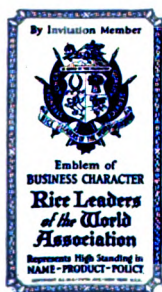
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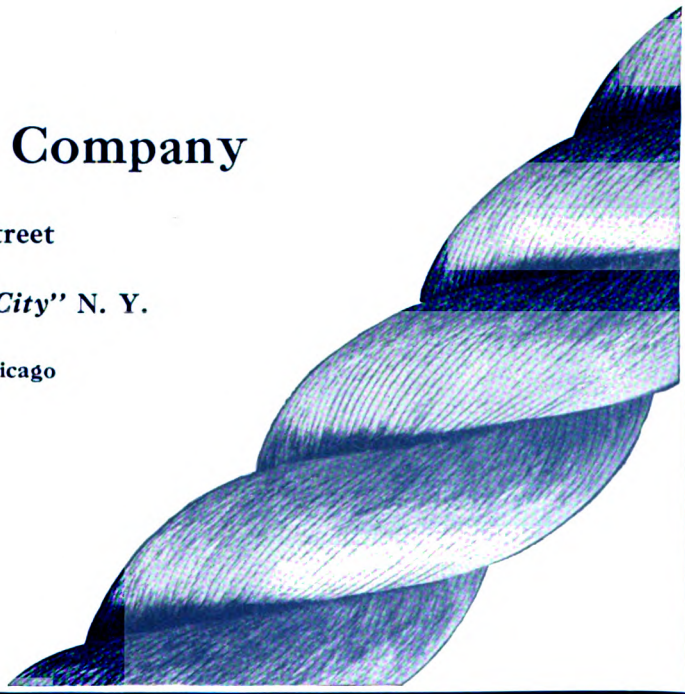


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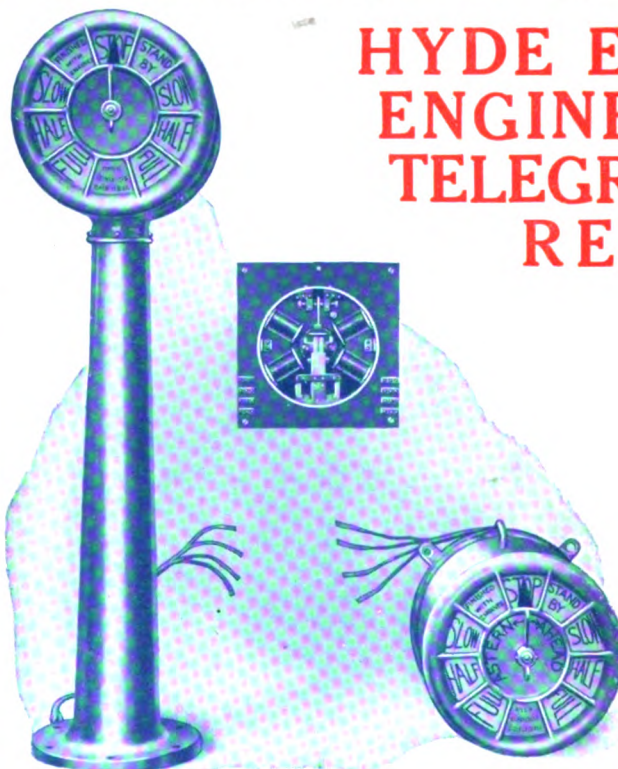
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